SEP 14 1959

SUBMARINE PACESETTER

Three Lines in One Pulled Into Gulf 40

B 792961

SUMATRA PIPE LINE

Hot Water Tracer Keeps Crude Moving 69

PIPE LINE INDUSTRY

THE LIBRARY OF CONGRESS SERIAL RECORD

SEPTEMBER 1959

f Publishing Company, 1959

ENGINEERING CONSTRUCTION OPERATIONS

46-4424

SPECIAL MAINTENANCE REPORT

ENGINE PROTECTION

Pressurized Stations Save Engines 49

RADIOACTIVE SLEUTH

Facts About Engine's First 100 Hours 53

STABLE RIVER CROSSINGS

Piling, Rock Fill Hold River in Check 56

FIRE PROTECTION

Synthetic Lubes Pass Gas Turbine Tests 64

For a "Quick Look" at this issue, turn the page . . .

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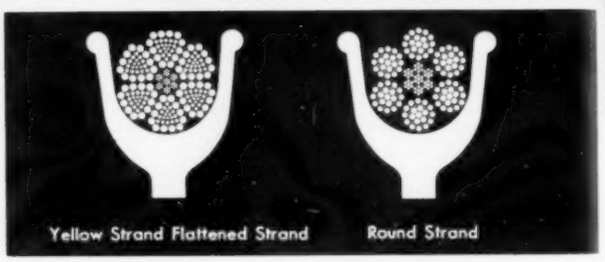

HOW

Houston Contracting Company

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This was a tough one. Wide ditch – heavy, wet dirt – high line speeds over a short distance – severe reverse rope bend – an extra large bucket. Rapid wear and fatigue actually tore apart ordinary round strand rope to the tune of five to seven 50′ lengths per day. Then Houston Contracting Company selected Yellow Strand Flattened Strand Wire Rope. Now, one length per day is used in place of five to seven. They cut rope costs by 50%, saved substantially in man-hours and machine down time.

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Yellow Strand®

WIRE ROPE SLINGS CLIPS

SEP 14 1959

PIPE LINE INDUSTRY

September 1959 Vol. 11, No. 3

CONTENTS and Quick Look

To help you put first things first, scan these time-saving digests, checking ☑ those you want to read first.

Three Pipe Lines in One Laid Seven Miles Into Gulf

☐ Laying a single pipe line into the Gulf of Mexico calls for plenty of skill on the part of the designers and contractor. Make it a molten sulfur line, jacketed, with a hot water conduit, then insulated and rolled into a casing and you have some idea of the problem Freeport Sulphur Company and Sharman, Allen, Gay and Taylor faced. Pipe for the two "hot lines" has a 60,000 psi yield strength which required a special U-bevel and welding with an argon gas shielded arc. Two additional water lines were pulled "piggy back."

By Melvin A. Judah and Donald G. DePugh . . Page 40

SPECIAL MAINTENANCE REPORT

How to Solve the Dust Storm Problem

☐ Northern Natural developed a system which has proved more than adequate to cope with the severe dust storms right in the Dust Bowl itself. Before the company pressurized the buildings with clean, filtered air, operators and maintenance crews had to cart dust from the building after every storm. But, thanks to the new system, there's hardly a spot of dust even after severest storms.

By Donald M. Taylor . . . . . Page 49

What Happens to Engines in the First 100 Hours

☐ Radioactive tracers in the engine oil are providing the answers. For if lube oil is burned in the power cylinder, radioactive isotopes show up instantly in the engine exhaust. If you know your engines, try to answer the questions asked by the author at the beginning of the article. Then find the answers.

By E. J. Fithian . . . . . Page 53

Holding Back a River

☐ This can be a taxing and expensive maintenance problem. Texas Illinois pipeliners not only diverted the White River current sufficiently to protect their lines, they came up with a unique idea in river control which may be duplicated by other industries. . . . . Page 56

How to Get The Most Out Of Electrical Controls

☐ What to look for when trouble-shooting electrical controls and how to maintain them. Because controls are so reliable, they are often slighted. This can sometimes lead to "chain reaction" type difficulties. The solution is to set up a scheduled maintenance program and to train men for prompt trouble shooting.

By H. A. Wright . . . . . Page 59

Synthetic Lube Passes Texas Eastern Turbine Tests

☐ Application of this new phosphate ester for 13,400 hp unattended gas turbine units was an extra safety precaution taken in design. Design engineers, plus the turbine and compressor manufacturers tested several types for chemical, lubricating and fire resistant properties before start up. After 3,000 hours operating performance, the synthetic lubricant has met all specifications . . . . . Page 64

What Research Discovered About Pressure Surges

☐ Our crude and products pipe line systems are going to higher and higher pressures; wall thickness of the pipe is getting thinner and thinner. For this reason, pressure surges and their control have become more and more important to pipe line engineers. Here is a summary of what researchers have found out about this problem during the last 10 years.

By Robert D. Kersten . . . . . Page 66

Hot Water Line Heats Crude in Sumatra Pipe Line

☐ To pipe line 105° pour point crude Standard-Vacuum laid a 3-inch hot water line in the same ditch with the 8-inch carrier line. At river crossings the hot water line taps into an insulated 10-inch "jacket water" line to keep the crude oil from congealing. Only two operating freeze-ups have occurred: they were "liquidated" with little difficulty by circulating hot water . . . . . Page 69

Confidential Checklist Measures Boss-ability

☐ These Cities Service employes write what they want about their supervisors, but an independent firm tabulates the answers. The results are paying off, too—for both the company and its supervisors. You'll want to read all about this interesting plan.

By M. D. Poteet . . . . . Page 75

REGULAR MONTHLY DEPARTMENTS

Editorial Page	4
Pipe Line Panorama	39
Ideas for the Future	73
Rules of Thumb	77
Pipe Line Hints	78
Construction News	82
Pipe Line Men in the News	101
Who's Meeting Where	105
On the Line	106
Service and Supply Men	109
Classified Advertising	116
What's New in Equipment	117
New Equipment Literature	128
ADVERTISERS' INDEX	130

PIPE LINE INDUSTRY published every month. Entered as second class mail matter July 9, 1954, at the post office at Houston, Texas, under the act of March 3, 1879.

Politics is Gulf's business – and Yours

A new force is emerging to counter the creeping sickness of excessive government control over industry. That force is industry itself.

Admitting such efforts have long since been overdue, several companies have decided to shake loose their political handcuffs and take positive action to stop the growing trend to stifle free enterprise. This action, if the public can only be made to realize its significance, may well determine the paths our national economy will follow in the future.

An excellent example of the new force is Gulf Oil Corporation's recently adopted program. Recognizing that we have a heritage to save or to lose, Gulf has undertaken a non-partisan political education program that will underscore the importance of individual participation in politics.

The program begins with the local community where the ballots are cast and public officials elected. It includes three phases:

1. Local and regional Political and Legislative Activity. It is in this area that political supervisors function. They have but one aim: *What is good for a community or region must be good for Gulf.*

These regional representatives, chosen because of their knowledge of the company, industry and area, are equipped with a training program that will enable them to train some of the district managers in the marketing, transportation and production departments. These men will be instrumental in carrying out the program.

2. National Legislative Activity. A Gulf office is being established in Washington staffed by a legislative analyst who also will be a registered lobbyist. Also, a political writer will serve as public relations representative in Washington.

3. Political Information and Education. This activity includes a bi-weekly newsletter from Washington summarizing all legislative activity that pertains to the oil industry. Company publications are being used to explain the program.

The program is being conducted on a strictly non-partisan basis. Recognition of particularly outstanding civic or political contributions by employes will be made in the company's publications. Consideration will be given to the granting of leaves of absence to employes who may be elected to office. The wives also are being encouraged to become active in carrying out the objectives of the program.

In short, Gulf's program recognizes that maintaining a just and sound government of the people will have to become a private citizen's do-it-yourself effort. For it is only where the votes are cast that a political renaissance can begin.

True, political action on the part of industry probably will intensify the clamor of self interests that big business and free enterprise must be controlled, that industry should be cut down to size, that it has no business in politics. It is almost certain that these interests, in their "truth be damned" anti-free enterprise crusades to win support, will urge the public to ignore completely the simple fact that free competition, unfettered by excessive control, has been the backbone of this nation's economic progress.

One of the most notable of these self interests is big labor. Union leaders have publicly announced an all-out drive to control U.S. politics. Thus, it has become important—even imperative—that counteractive efforts be made to insure government representing all of the people, rather than the selfish interests of a few.

No better effort could be made to achieve this goal than Gulf's program to make politics everybody's business.

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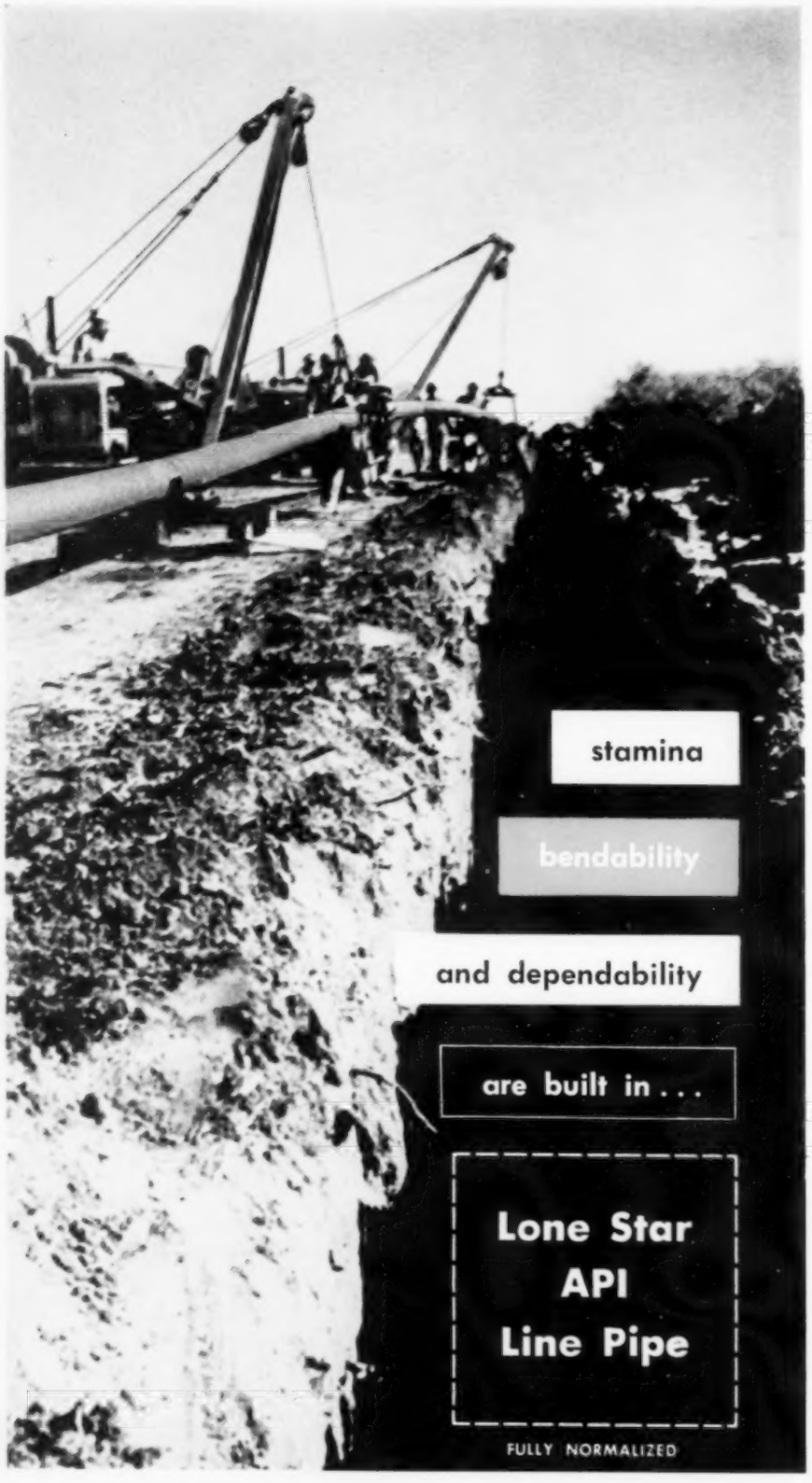

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Indexed by Engineering Index

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Improve Diesel and Gas Engine Performance!

PEDRICK Piston Ring Sets for diesel and gas engines are "precisioneered" to assure maximum power with minimum oil consumption, to most effectively seal against blow-by, to deliver the greatest number of hours of efficient performance at lowest operational and maintenance costs.

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That's why PEDRICK Engineered Sets are used as original equipment in practically all leading heavy-duty diesel and gas engines . . . and why when replacement rings are installed, PEDRICK Engineered Sets are specified by most maintenance men.

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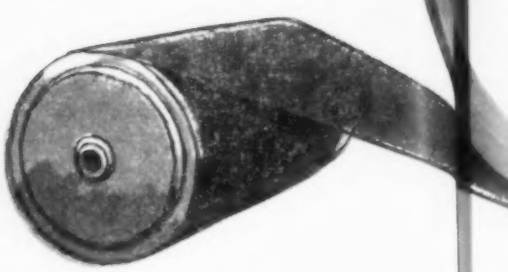

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J-M Blue Flag Wrap is made of specially formulated, chemically resistant glass fibers which are parallel reinforced with continuous strands of fiber glass yarn for high-speed application.

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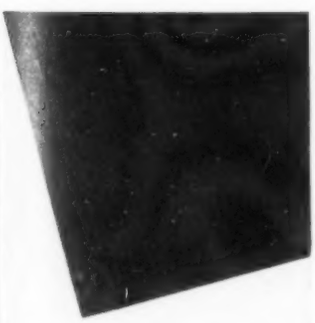
Johns-Manville Blue Flag Wrap is a uniformly porous fiber glass wrap. It lets enamel bleed through quickly . . . actually becomes an integral part of the over-all pipe coating. Like steel reinforcement rods in concrete, Blue Flag reinforces the pipe enamel giving it extra strength, hence extra working life. Because it is made of inert, inorganic fiber glass, this wrap cannot rot, decay, or absorb moisture.

With L.O.F. Glass Fibers Company joining the J-M family, buyers of pipeline wraps and tapes are now additionally served . . . by an enlarged staff of Johns-Manville sales and technical personnel operating out of 56 sales offices . . . by expanded distribution facilities . . . by the addition of 7 strategically located plants . . . by expanded research and product development laboratories. For further information, write to J-M, Box 158, N.Y. 16, N. Y. In Canada, Port Credit, Ont.

and service life for pipelines



J-M Transhield Felts, asbestos reinforced with parallel glass fibers, come in 2 types for field or mill wrapping: #15 Transhield (Heavyweight); #8 Transhield (Standard). #15 plain Asbestos Felt also available.

2 J-M Transhield—for a tough outer shell

Apply an outer wrap of this inert, inorganic asbestos felt—and give your pipeline investment *complete* long-life protection. Asbestos, the magic mineral, comes from the ground . . . is always at home in the ground . . . won't rot or decay. In J-M Transhield these asbestos fibers are impregnated with a coal tar or asphalt saturant to form, literally, a flexible covering of stone, providing a strong, highly durable outer protective shell.

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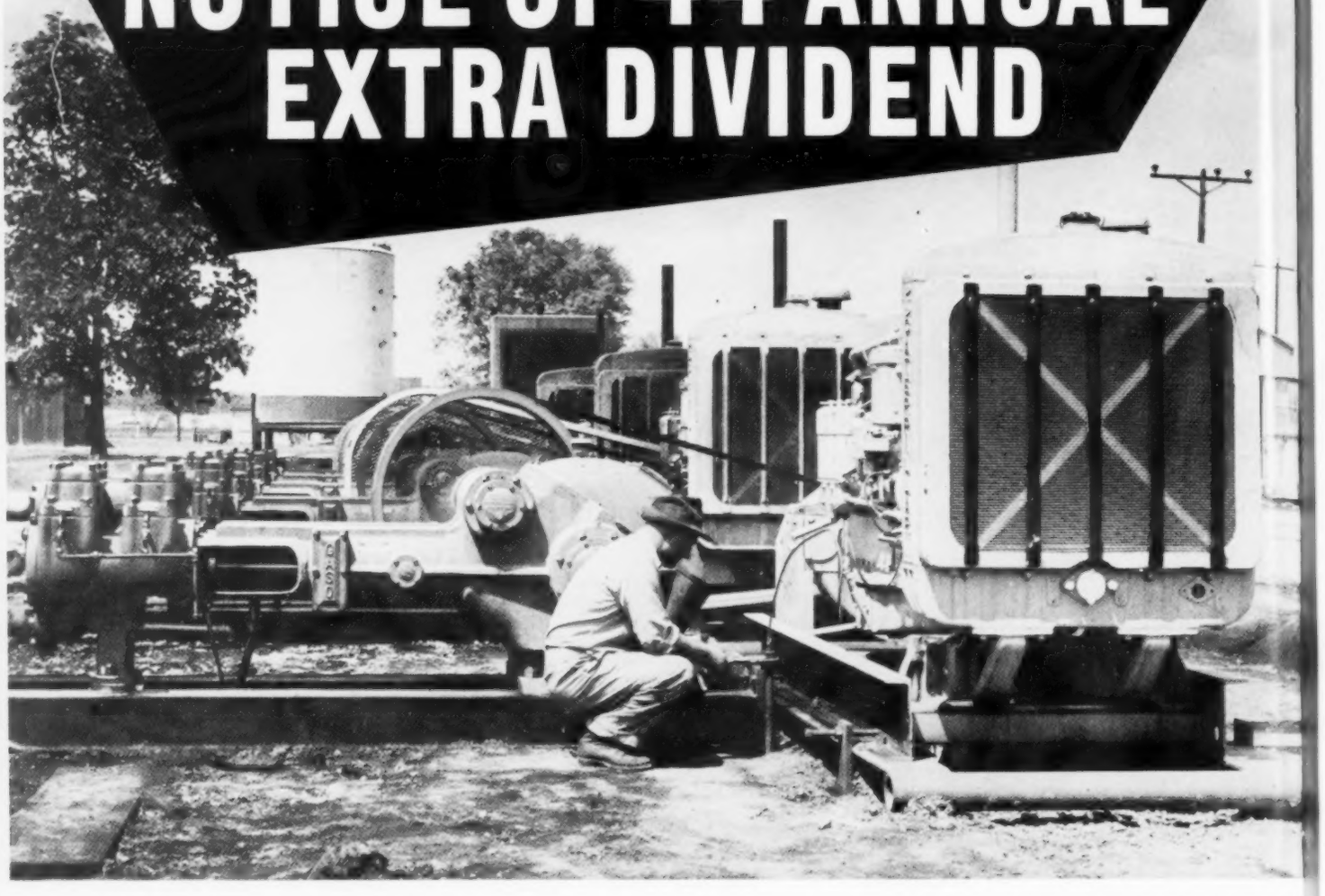

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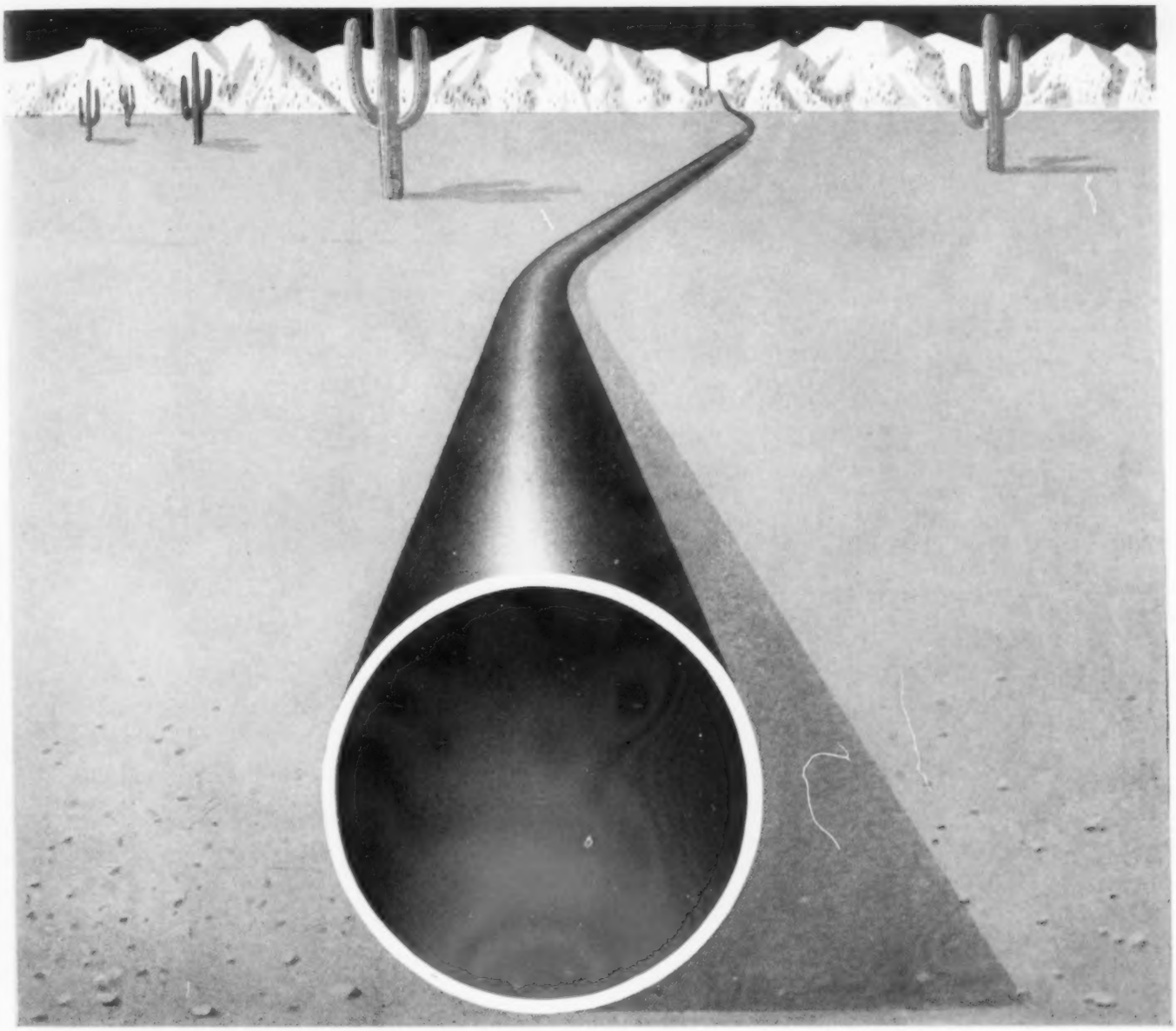

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defies 180°F. heat without sliding and −10°F. cold without cracking

Allied Chemical Hotline Enamel's resistance to both high and low temperatures, as well as its greater durability, compared to asphalt base and other coatings, has been proved by laboratory tests, and on-the-job performance for leading public utility companies. Allied Chemical Hotline Enamel is derived from coal-tar pitch, thus possessing inherent protective properties against the damaging effects of water, soil chemicals and electrical currents.

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Garlock Metal Packings (above) prevent escape of air or gas from compressors. Sets are supplied with segmental packing rings (right) super-finished to 15 micro-inches or less for better sealing.

Seal air and gas compressors this proven way... with Garlock Metal Packings

Every metal packing set that leaves the Garlock factory must meet the following rugged standards:

1. Gas tight seal between packing rings and compressor rod.
2. Gas tight seal between packing rings and packing groove.
3. Packing must not be affected by operating conditions.
4. Operating conditions must not be affected by packing.
5. Packing must have no adverse effect on compressor rod.

Get these fine features by specifying Garlock metal packings. Choose from many different styles and materials. Whichever you select, you can be sure of the finest metal packing available for air and gas compressor service.

Metal packings and oil scraper rings are more of the Garlock 2,000 . . . two thousand different styles of packings, gaskets, and seals for every need. Assure yourself of the proper application by discussing it with your local Garlock representative. Call him, or write

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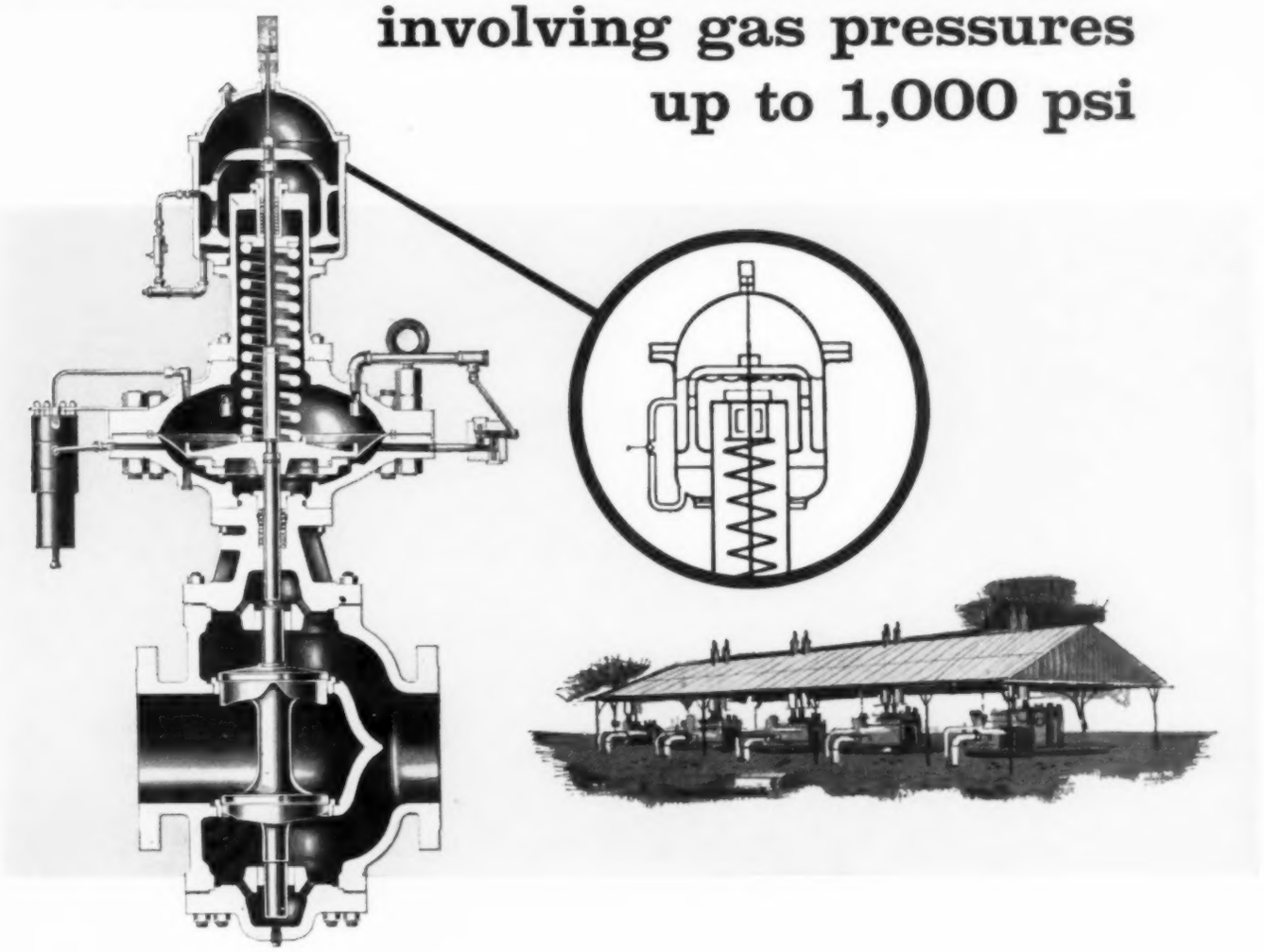
Handles uncommonly rough jobs involving gas pressures up to 1,000 psi



Oil dash pot prevents inner valve "jump"

When the gas industry needs a regulator that can withstand the dynamic forces of large flows and high velocities, it turns to the Fisher Type 885-1. Here's the ideal high pressure gas regulator for the difficult reducing jobs on transmission lines and large town border stations. The inner valve is dampened and cushioned by a special oil dash pot. The inner valve jumping sometimes encountered in high capacity, high pressure systems is eliminated. For further information about the Fisher Type 885-1, send for Bulletin P880-A.

FISHER
TYPE
885-1

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FISHER® Controls
SINCE 1880

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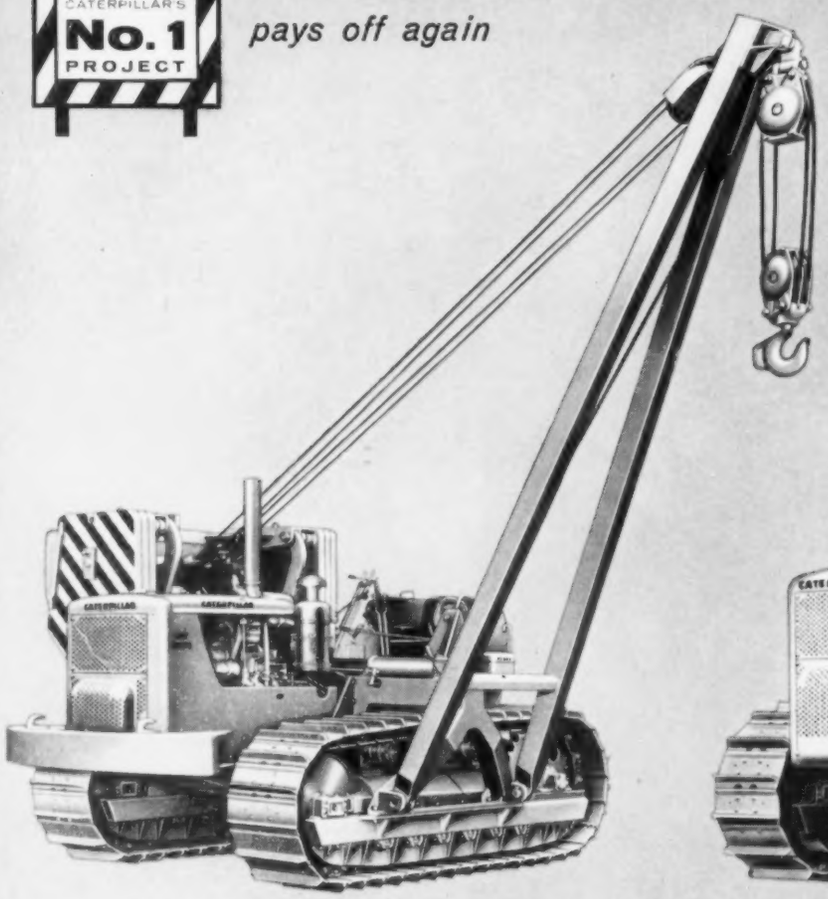
*PROJECT PAYDIRT**

pays off again



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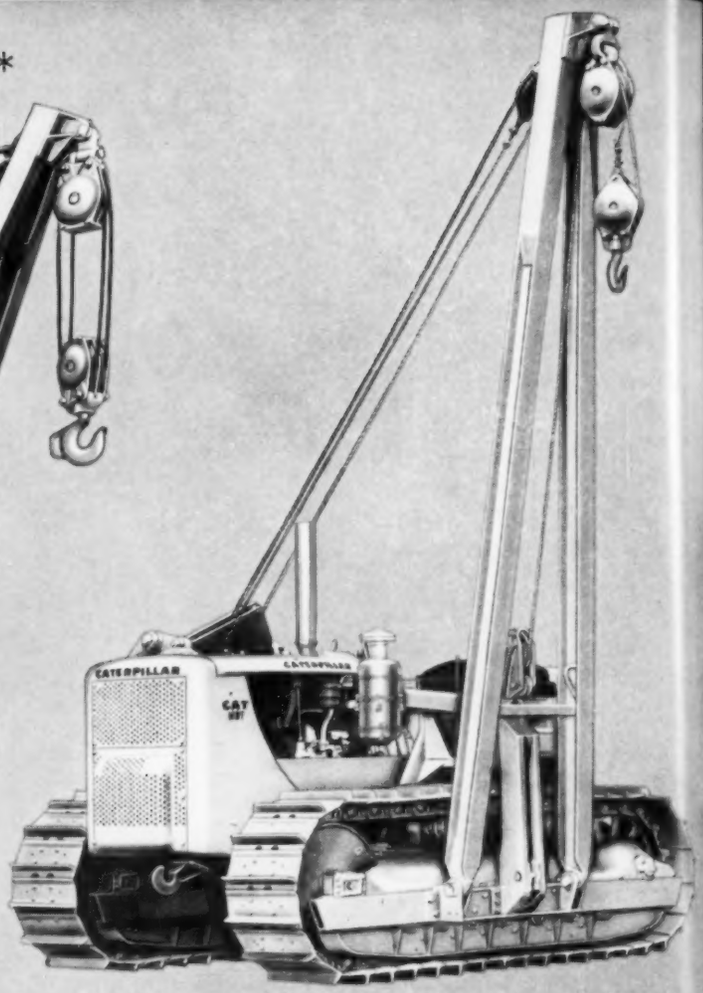

MD7

2 NEW MODELS OF CAT-BUILT

THE PAYOFF FOR YOU: HIGHER PRODUCTION AT

Here are two new models of Cat-built Pipelayers designed to deliver even greater production at lower operating cost than the models they're replacing. Designed specifically for pipeline work, they're built to pay off in performance that no other units in their class can match.

Caterpillar's Project Paydirt sparked the improvements that account for their superiority. Major improvements include a new turbocharged 140 HP Engine, new lifetime lubricated rollers and idlers and new dry-type air cleaner. At the same time, many job-tested Caterpillar features have been retained.

As a result, there's more power, longer life and less maintenance—in short, *more profit* for you!

Get the complete facts about the new machines from your Caterpillar Dealer. There's a spot for each in your spread. Ask him to demonstrate. Say when and where—he'll be there! (See the great new No. 583, D8 and D7, too!)

Caterpillar Tractor Co., Peoria, Illinois, U. S. A.

FAST FACTS ABOUT THE NEW PIPELAYERS

	No. 572 Series D	MD7 7-roller frame
Lifting capacity (4-ft. overhang), lb.	86,000	54,200
Turbocharged engine, horsepower at sea level	140	140
Drive	Torque converter	Direct, oil clutch
Ground clearance, in.	19	15½
Total extendable counterweight, lb. (approx.)	10,900	8,600
Approximate shipping weight, lb.	58,500	35,800

CATERPILLAR

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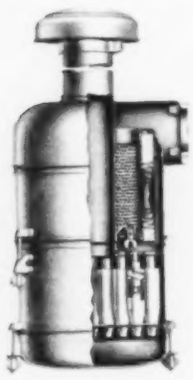
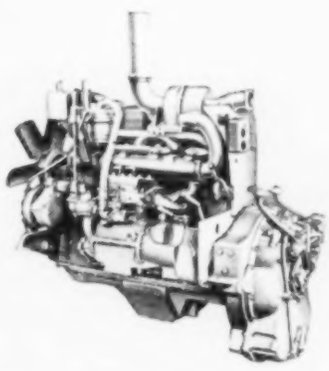
PROVED IN THE FIELD

PIPELAYERS FOR YOUR SPREAD

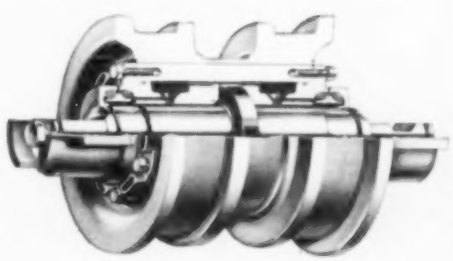
LOWER COST AND LONGER LIFE, LESS MAINTENANCE!



NEW DRY-TYPE AIR CLEANER. Here's still another major Caterpillar research development on these machines — the new dry-type air cleaner which removes at least 99.8% of all dirt from intake air during every service hour. Filter element can be cleaned and re-used. Cleaner can be serviced in 5 minutes. Payoff: longer engine life, greater economy, less maintenance.



NEW TURBOCHARGED ENGINE. The horsepower of these modern, heavy-duty pipelayers is up from 128 to 140 at the flywheel, an increase of 9%. Since the turbocharger uses waste energy from the engine exhaust to pack more air into the cylinders, over-all efficiency and fuel economy are substantially increased. Another payoff: faster response to load changes.



NEW LIFETIME LUBRICATED ROLLERS AND IDLERS. That's right — lifetime! In a major research breakthrough, Caterpillar has achieved track and carrier rollers and idlers that never require further lubrication until rebuilding. On-the-job roller lubrication is eliminated. Over-all payoff: greater economy and less maintenance than with ordinary rollers and idlers.

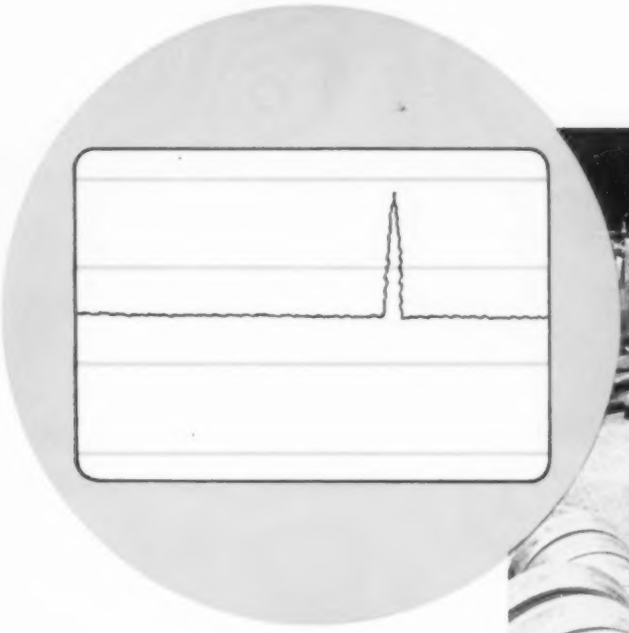
* ***PROJECT PAYDIRT:*** Caterpillar's multimillion-dollar research program — to meet the continuing challenge of the greatest pipeline construction era in history with the most productive machines ever developed.

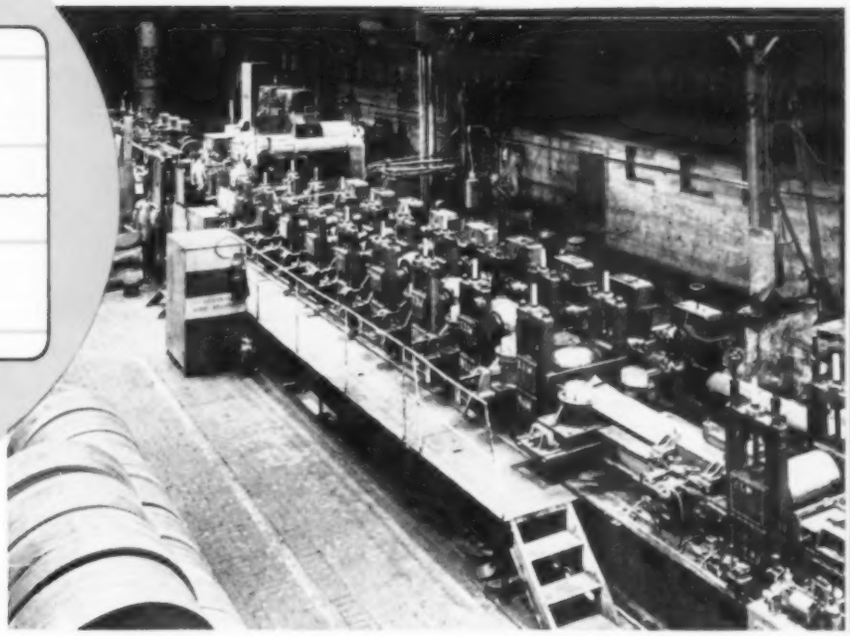
Making The Tough Jobs Look *Easy*

The tougher the job the better Sam Carline engineers like it. That's why Sam Carline pipelines form a network of achievement throughout the deep South. That's why — when the going looks hard — smart companies rely on Sam Carline to do the job. The recently completed 4 mile Transcontinental job near Thibodaux (pictured) was a typical example. Carline crews, working in wild swamp country, finished this job in record time.

SAM CARLINE, Inc.

CALL 9031 • BERWICK, LOUISIANA





ACME-NEWPORT ELECTRONIC EYE...

A Remarkable Advance in Line Pipe Quality Control

Now Acme-Newport offers line pipe users the advantages of the Reflectoscope, a unique device that scans the pipe for possible defects invisible to the human eye. This new electronic equipment augments our many other quality controls, such as chemical and physical testing of line pipe steel, the flattening test, and visual and hydrostatic inspection of finished pipe. It is still another Acme-Newport safeguard to quality in electric weld line pipe, ensuring ease of installation and years of trouble-free service.

A continuous program of improving facilities and methods, combined with the services of experienced personnel, makes this basic steel producer a most reliable source of supply. For *your* needs in electric weld line pipe, 4″ and 6″ sizes, standard or thin wall, contact Acme-Newport.

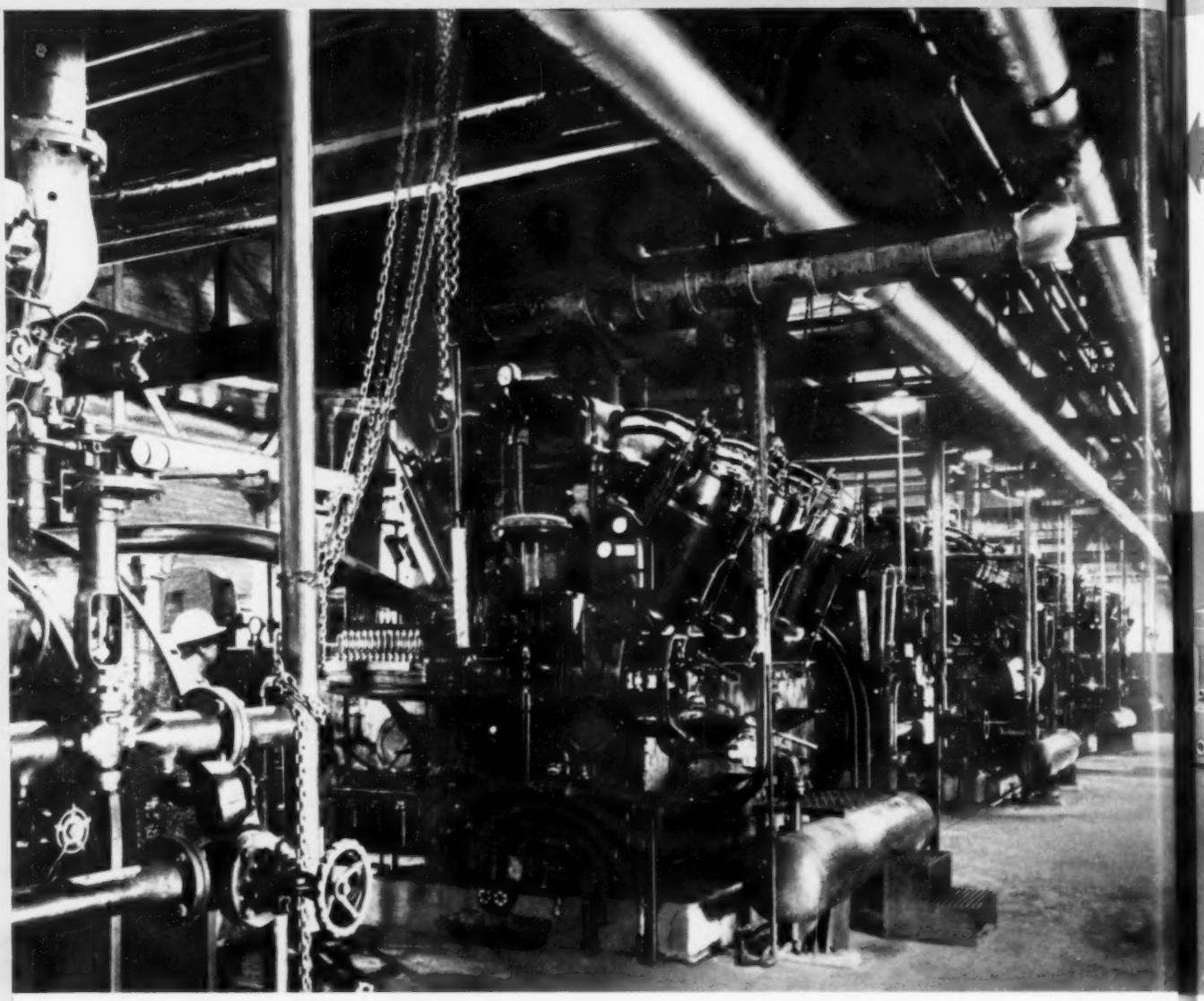
SIZES AND WEIGHTS AVAILABLE

O.D.	Wall	Wt. Per Ft.
4½	.125″	5.84
	.142″	6.61
	.156″	7.25
	.188″	8.64
	.219″	10.00
	.237″	10.79
6⅝	.156″	10.78
	.188″	12.89
	.219″	14.97
	.250″	17.02
	.280″	18.97

Acme-Newport Steel COMPANY

NEWPORT, KENTUCKY

A SUBSIDIARY OF ACME STEEL COMPANY



Cellulubes by Celanese minimize threat of fire a

Protection of your personnel, plant and equipment against fire and explosion is a vital need. Cellulubes made by the Celanese Corporation of America can help you provide this protection. They resist the propagation of flame under conditions which could result in serious fires with other lubricants. And they give you so much more!

CELANESE CORPORATION OF AMERICA, CHEMICAL DIVISION
DEPT. 576-S, 180 MADISON AVENUE, NEW YORK 16, N. Y.

Please send me:

☐ Technical bulletin ☐ Sample of _____ viscosity.

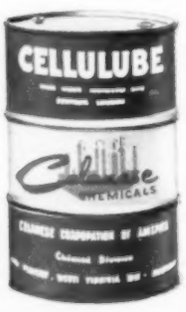
Name _____ Title _____

Company _____

Address _____

City _____ Zone _____ State _____

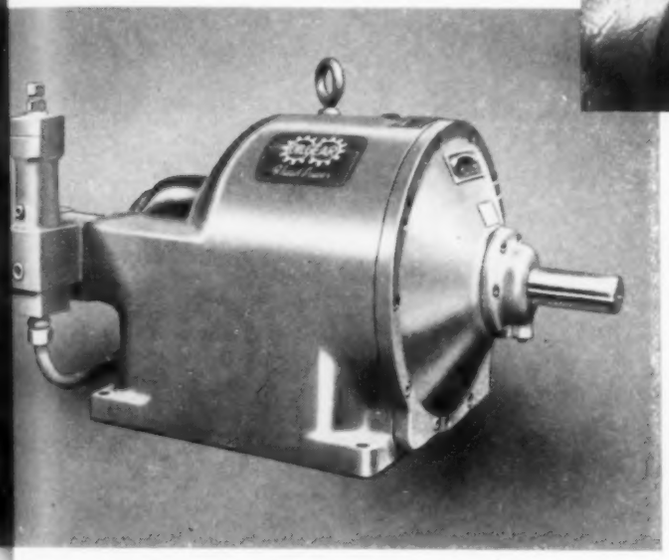
Application I have in mind _____



FM
Factory Mutual-Approved
(Cellulubes 150 and 220)

CYLINDER WEAR PROVED NEGLIGIBLE when fire-resistant Cellulubes were used to lubricate four Cooper-Bessemer air compressors, as two years' testing showed. Moreover, there were no pressure surges or evidence of fire in the air accumulator. Deposits normally found in compressor auxiliaries and valves were reduced or eliminated thanks to the detergent action of Cellulubes. Conventional lubricators could be used to pump the Cellulubes.

SAFETY, EFFICIENCY, COST SAVINGS are the advantages of Cellulubes discovered by Trunkline Gas Company Texas, after using these lubricant fluids for three years in their air compressors: Cellulubes eliminate risk to personnel from fire, explosion, fragmentation. Cellulubes do not get dirty or burn away by friction or compression. Cellulubes save on replacement costs, downtime, and maintenance. Cellulubes keep machinery smooth-running and clean.



USED FOR YEARS under rigorous conditions in pumps made by the Oilgear Company of Milwaukee, Wisconsin, Cellulubes provided superior protection against excessive wear. Cellulubes, which are phosphate ester synthetic fluids, can be employed in pumps at higher temperatures than fire-resistant fluids which contain water. They are suitable for use in all types of hydraulic pumps being used today, including vane, piston and gear pumps.

fire and explosion...protect machines against wear

For example, Cellulubes give overall wear protection comparable to that of premium petroleum oils. They present no foaming problem and have no additives which might deposit in the system. In fact, these synthetic lubricants and hydraulic fluids have a cleansing action inside machinery. Their vapor pressure is extremely low; this means that fluid losses are negligible even under severe operating conditions. Cellulubes are available in six viscosity ranges to meet all the standard needs of industry. Viscosity ratings do not change despite the toughest conditions of mechanical shear.

A pioneer in fire-resistant fluids, Celanese offers you years of field experience and research background to serve your needs. For more information on Cellulubes, mail the coupon to us today.

Celanese Corporation of America, Chemical Division, 180 Madison Ave., New York 16, N. Y.

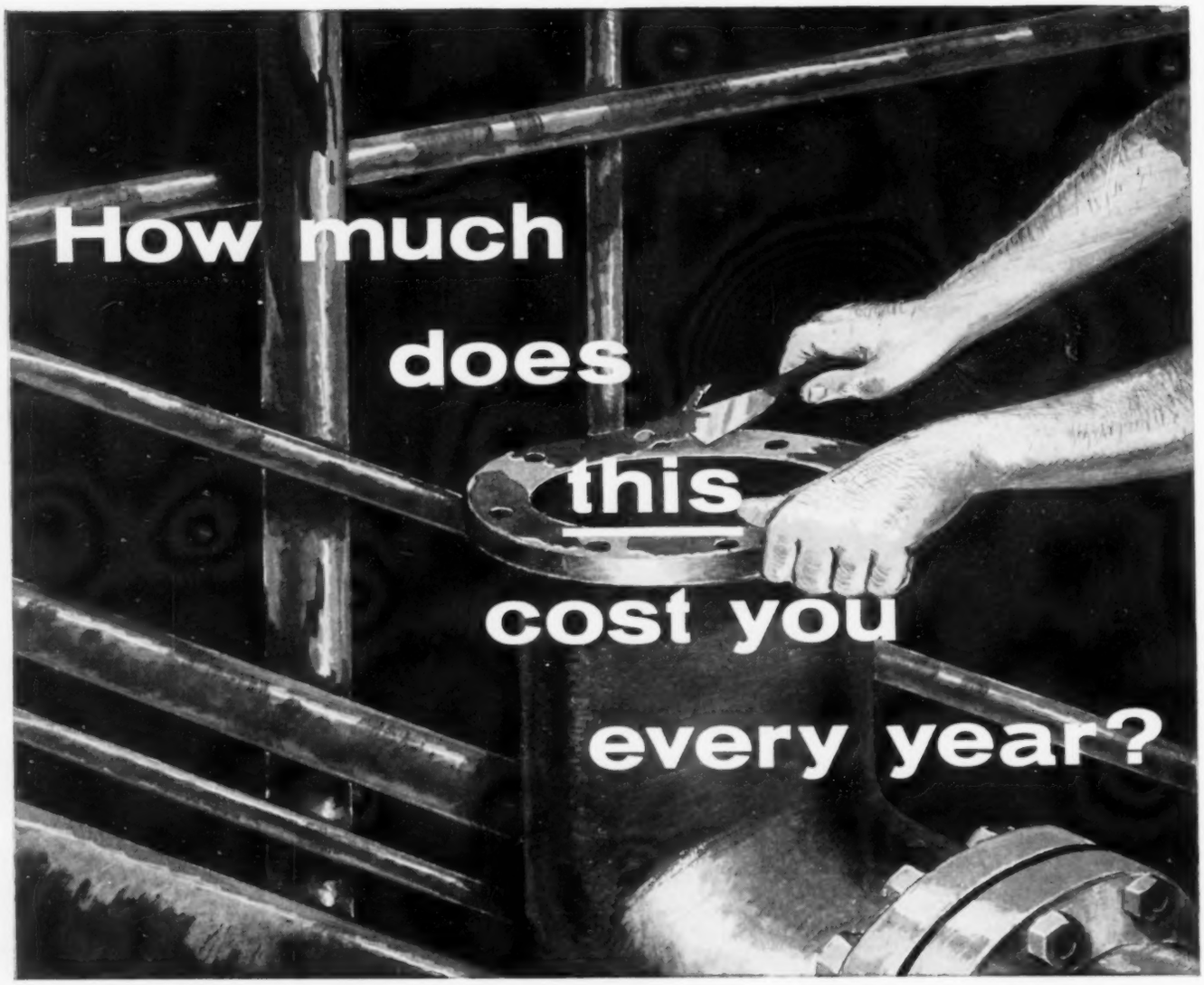
Celanese® Cellulube®

Cellulubes... Celanese CHEMICALS fire-resistant functional fluids

In Canada: Canadian Chemical Company Limited, 2035 Guy St., Montreal, Toronto, Vancouver • Export Sales: Amcel Co., Inc., and Pan Amcel Co. Inc., 180 Madison Ave., New York 16

CELANESE CELLULUBES

Maintenance Cost Too High?



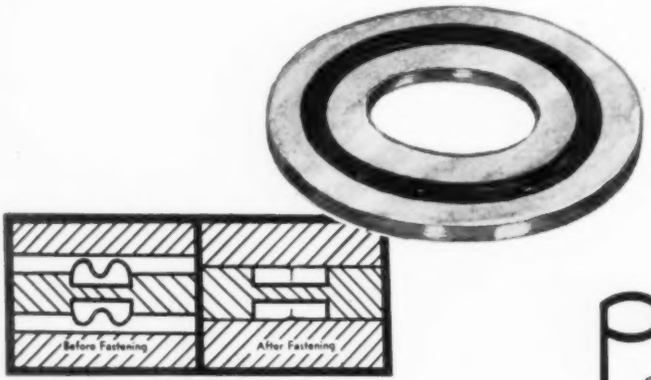
How much time, effort, and money is spent cleaning, resurfacing and/or replacing flanges to replace the seal !

Expensive? Yes!

Why not find out about Gask-O-Seals and save! Here are the facts: With Gask-O-Seal, flange faces require little or no cleaning or resurfacing of flanges when replacing the seal — *and Gask-O-Seals are re-usable.*

Gask-O-Seals save money and effort in many other ways, too. They are visually inspectable, do not need to be re-torqued, there is no material creep and they are non-directional, non-flexible, easy to install. They provide no-leakage sealing, *can not blow out,* and there is no wear due to pulse.

Now available to fit ASA standard flanges. Write for free catalog.



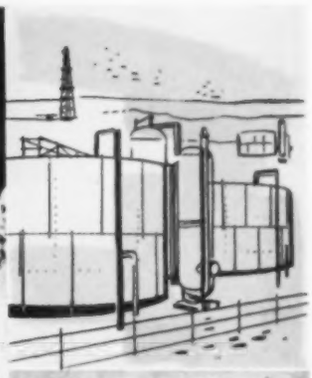
Note metal to metal contact.

Parker SEAL COMPANY

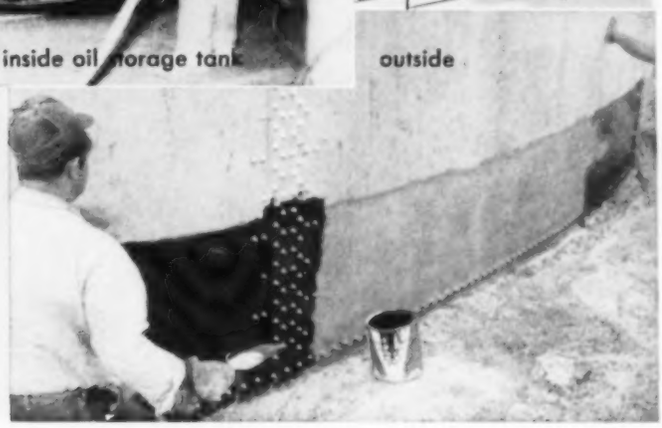
CULVER CITY, CALIFORNIA and CLEVELAND, OHIO

A DIVISION OF PARKER-HANNIFIN CORPORATION

inside oil storage tank



outside



Why **COOK'S** COROTAR *is your best buy in . . .*

PROTECTION AGAINST CORROSION

Here's your key to lock out corrosion in oilfield, refinery, pipeline or chemical plant applications. It does an outstanding job of sealing metal, wood or concrete from the corrosive action of liquids, gases, salts and moisture. It's EASY TO APPLY. It costs little—because of the extra years of protection it gives.

What is Cook's Corotar? It's a combination of selected coal tar pitches and epoxy resins. Gives you the water resistance of coal tar plus the chemical resistance, toughness and adhesion of epoxy resin. The remarkable corrosion resistance of Corotar was first proved in rigorous laboratory tests. Then in the performance of thousands of gallons in field service, under severest conditions.

Chemical Properties: Corotar gives high resistance to corrosive effects of dilute mineral acids, alkalies, fresh water, salt water, crude oil, hydrogen sulfide, petroleum products. Only Corotar gives you tested resistance to corrosion, scale and abrasion damage—plus practical pot-life, ease of application and smooth, uniform flexible film.

Where is it used? Just a few of many applications: Interior surfaces of crude oil storage tanks, freshwater and salt-water storage tanks; industrial cooling towers; exterior protection of utility gas lines; protection of offshore oil well equipment, chemical plant and fertilizer-manufacturing equipment; internal protection of salt water lines.

How is Corotar applied? Use brush, roller, conventional spray or airless spray. No primer is needed. Recommended 15-mil dry film thickness can be obtained in one coat with airless spray (two coats with other application methods). Coverage: 15-mil dry film thickness on 55 to 60 square feet per gal.

What about pot-life and drying? Pot-life of 6 hours at 80°. Higher temperatures shorten pot-life but speed cure. Pipes and tanks interior-coated may be put into service in as little as 48 hours.

Cost? *Versatile, economical Corotar gives years of service at a cost of less than 1 cent per mil, per square foot. Saves much expensive downtime due to corrosion problems, and prolongs life of equipment.*

FREE SPECIFICATION AND APPLICATION SERVICES

Cook's experienced engineers will help analyze corrosion problems, make recommendations, and prepare specifications for you or your contractor on application of Corotar. Same goes for any of Cook's many other heavy-duty finishes, including internal pipe coating, fuel and water resistant tank coatings and Pipe-Clad external pipe coating. Call or write for this service.

New Packaging: 5-gallon unit consists of 4½ gallons of Corotar in 5-gallon pail, with ½ gallon of curing agent in separate container. This allows easy mixing without need of extra empty pail. Also packaged in 1 gallons and drums.

COOK'S PAINTS

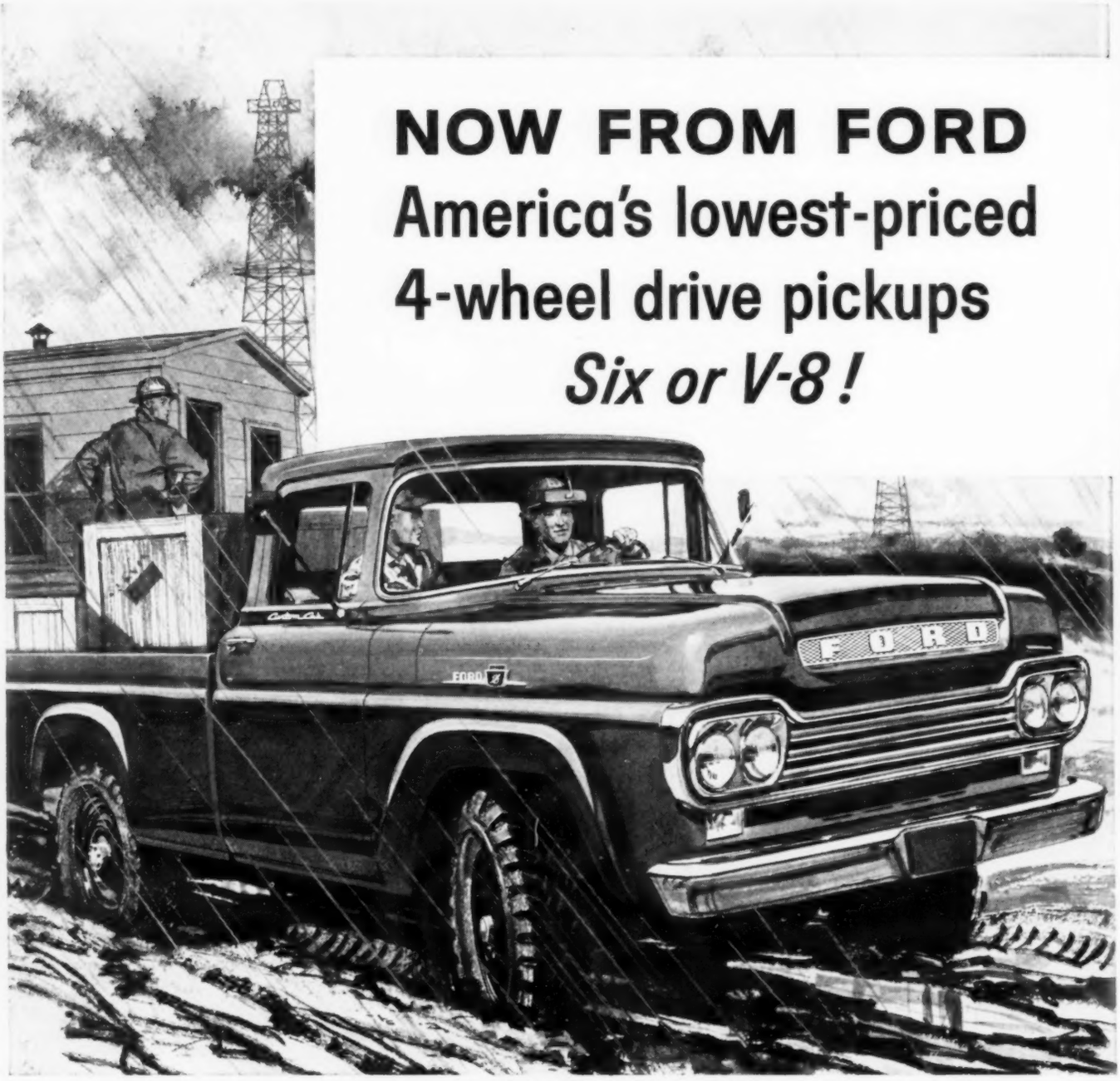
COOK PAINT AND VARNISH COMPANY

KANSAS CITY, Mo.
P. O. Box 389
GRand 1-4800
Teletype No. 154

HOUSTON
P. O. Box 3088
CApitol 8-2391

DETROIT
P. O. Box 5507
Fenkell Station
UNiversity 1-1000

NOW FROM FORD
America's lowest-priced 4-wheel drive pickups
Six or V-8!



New Ford F-100 4-wheel drive Styleside pickup handles heavy loads and makes its own road.

ALL FORD-BUILT . . . FACTORY-ENGINEERED . . . FOR GREATER SAVINGS!

Go *Ford*-ward for 4-wheel drive performance at big Ford savings. New Ford 4 x 4 Pickups have the power and traction to go most anywhere. They're factory-engineered from the ground up for extra stamina, and all Ford-built with your choice of economical Short Stroke power—Six or V-8.

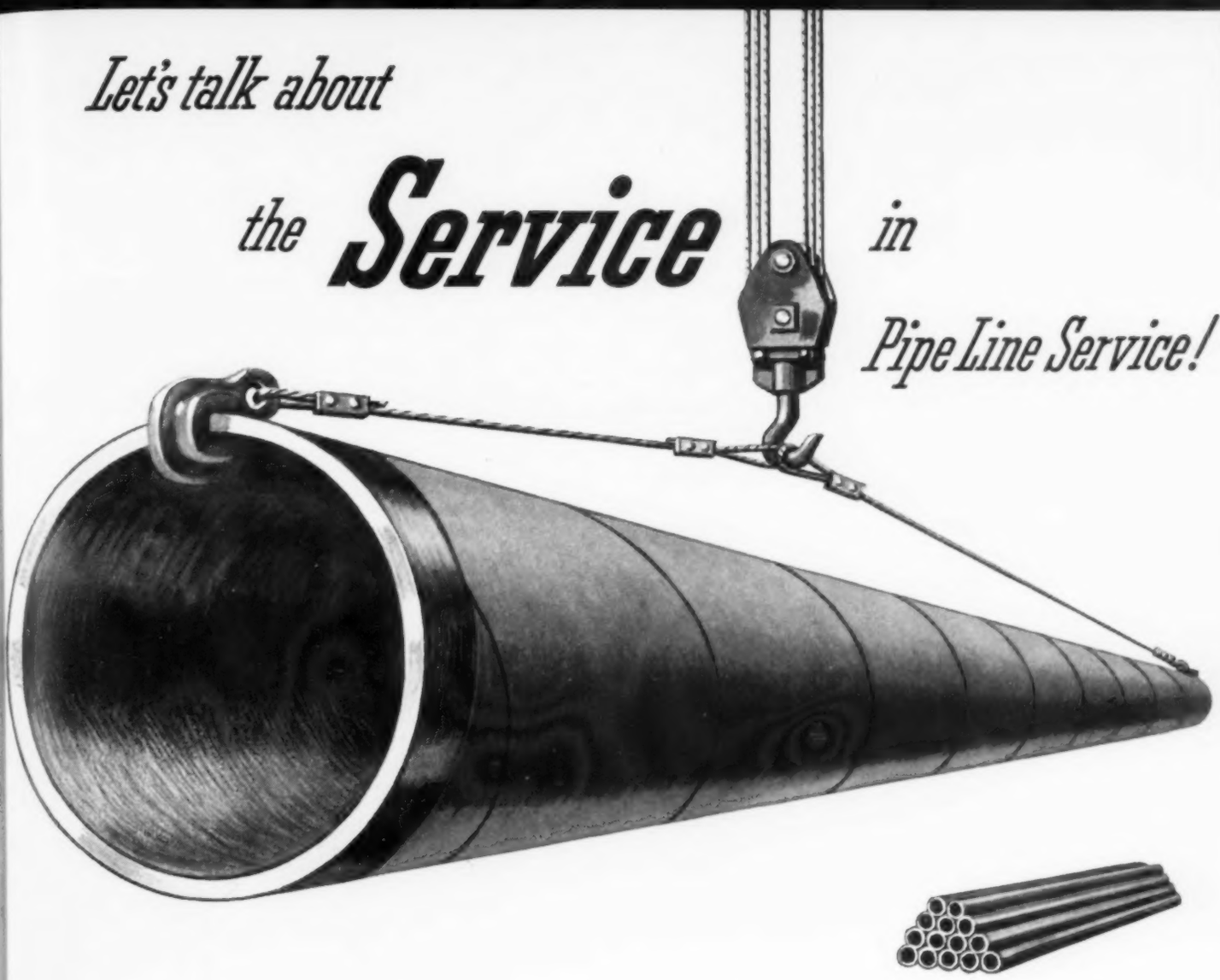
There's new versatility too, with two power take-off points in the transfer case to drive winches, saws, diggers, or other equipment. And there's new driving ease. You shift smoothly between 2- and 4-wheel direct drives while moving. Ford's *driverized* cab provides new riding comfort and modern styling.

Ford 4-wheel drive trucks are available in ½- and ¾-ton pickups, chassis-cabs and ¾-ton stake models. See your Ford Dealer . . . and save hundreds of dollars on America's lowest-priced 4 x 4's with Six or V-8 engine!

FORD TRUCKS COST LESS

LESS TO OWN . . . LESS TO RUN . . . LAST LONGER, TOO!

Let's talk about the **Service** *in Pipe Line Service!*



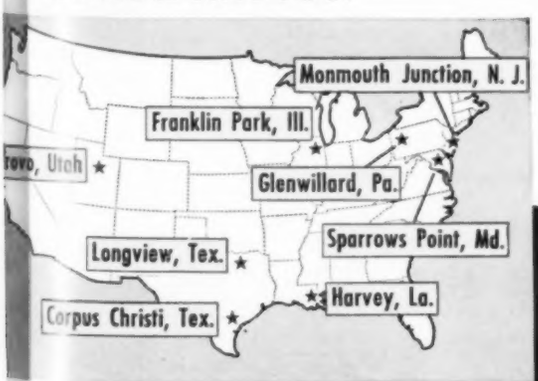
A company doesn't become a leader through quality of product alone. Although Pipe Line Service through the years has proved consistently that quality depends on coating and wrapping under controlled plant conditions, *service* is half the battle.

By service, we mean storing your pipe at plants strategically located near your sources of supply . . . and large storage facilities to allow you to purchase pipe when delivery is most favorable. Your pipe will be held in storage until needed—and then coated under the PLS high standards of uniformity. You *always* get a freshly applied coating job at the time pipe is ready to be laid. And PLS will ship your protected pipe *where* you want it . . . *when* you want it!

All this, *plus* the service of a PLS representative when needed. It's his job to help you in the proper handling, storage and laying of PLS protected pipe, to give you the maximum return on your investment.

This combination of quality *and* service assures you of the finest in pipe protection. On your next coating job call in your nearest PLS representative—you'll find that he can save you time, trouble and money.

There's a PLS plant strategically located to serve YOU!



Also sales offices at

Atlanta, Georgia — Lincoln, Nebraska
Dallas, Texas — Houston, Texas
Syracuse, N. Y.

PIPE LINE SERVICE CORP. — SERVICE — EQUIPMENT — MATERIALS — FRANKLIN PARK - ILL.

Pipe Line Service Corporation

FRANKLIN PARK, ILLINOIS

Quality pioneers in coating and wrapping pipe for a quarter century

A SUBSIDIARY OF AMERICAN STEEL FOUNDRIES

KOPPERS

on-the-spot availability of rings keeps your lines "on stream"

Dependable performance in all oil and gas applications

Koppers Piston Rings are now available in the field in a complete range of materials and a wide selection of types and sizes for every application in the oil and gas industry.

To gain trouble-free performance, lower operating costs and less frequent down-time, select Koppers Piston Rings—the choice of many original equipment manufacturers.

Koppers Piston Ring dependability, in even the most rugged applications, is backed with 38 years of experience in manufacturing rings of predictable performance.

If you have a ring problem, consult your Koppers field agent or write: KOPPERS COMPANY, INC., Piston and Sealing Ring Department, 4609 Scott Street, Baltimore 3, Maryland.

Send now for Koppers recommended Piston Ring Set-Ups applicable to the engines which you operate.

KOPPERS Sales Offices and Agents in these convenient locations:

Koppers Co., Inc.
District Sales Office
318 N. Pearl St.
Dallas 1, Texas

Lynn Elliott Co.
371 M & M Bldg.
Houston 2, Texas

Tri-State Industrial
Supply Company
520 Hawkins Way
El Paso, Texas

Nolan Sales Corp.
421 N. Cincinnati St.
Tulsa 20, Oklahoma

D. G. Silvey Co.
316 E. Kings Highway
Shreveport, Louisiana

Sample Bros.
2010 Big Bend Blvd.
St. Louis 17, Missouri

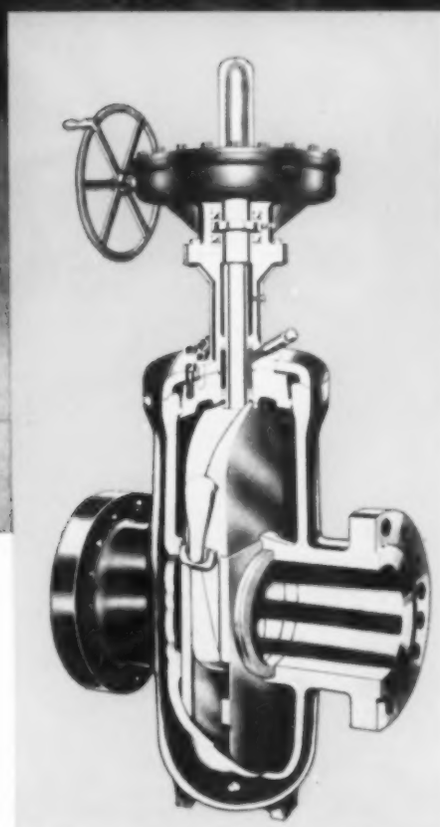
Sample Bros.
6315 Brookside Plaza
Kansas City 13, Missouri

KOPPERS

AMERICAN HAMMERED® INDUSTRIAL PISTON RINGS

Engineered Products Sold with *Service*

"Best Valve Insurance You Can Buy"



W-K-M® ASA Gate Valves

More than 300 rigid inspections certify the precision quality and long life that's built into every W-K-M pipeline valve. That's one reason W-K-M valves are recognized the world over for their superior construction and outstanding performance.

No other valves give you the same long-lasting service and economy. No other valves require so little maintenance.

Next time — and every time — specify W-K-M! Available at leading supply stores everywhere (from 2″ through 12″). Sizes through 34″ available on special order.

W-K-M Leverlock' Gate Valves feature through-conduit gate construction, parallel expanding gates, exclusive gate centralizers, controlled force seating, pressure seal bonnets, super-finished stems, seating surfaces sealed from the lading flow — and can be overhauled on-the-line.

Pressure Ratings: ASA 300 through ASA 1500 pounds.

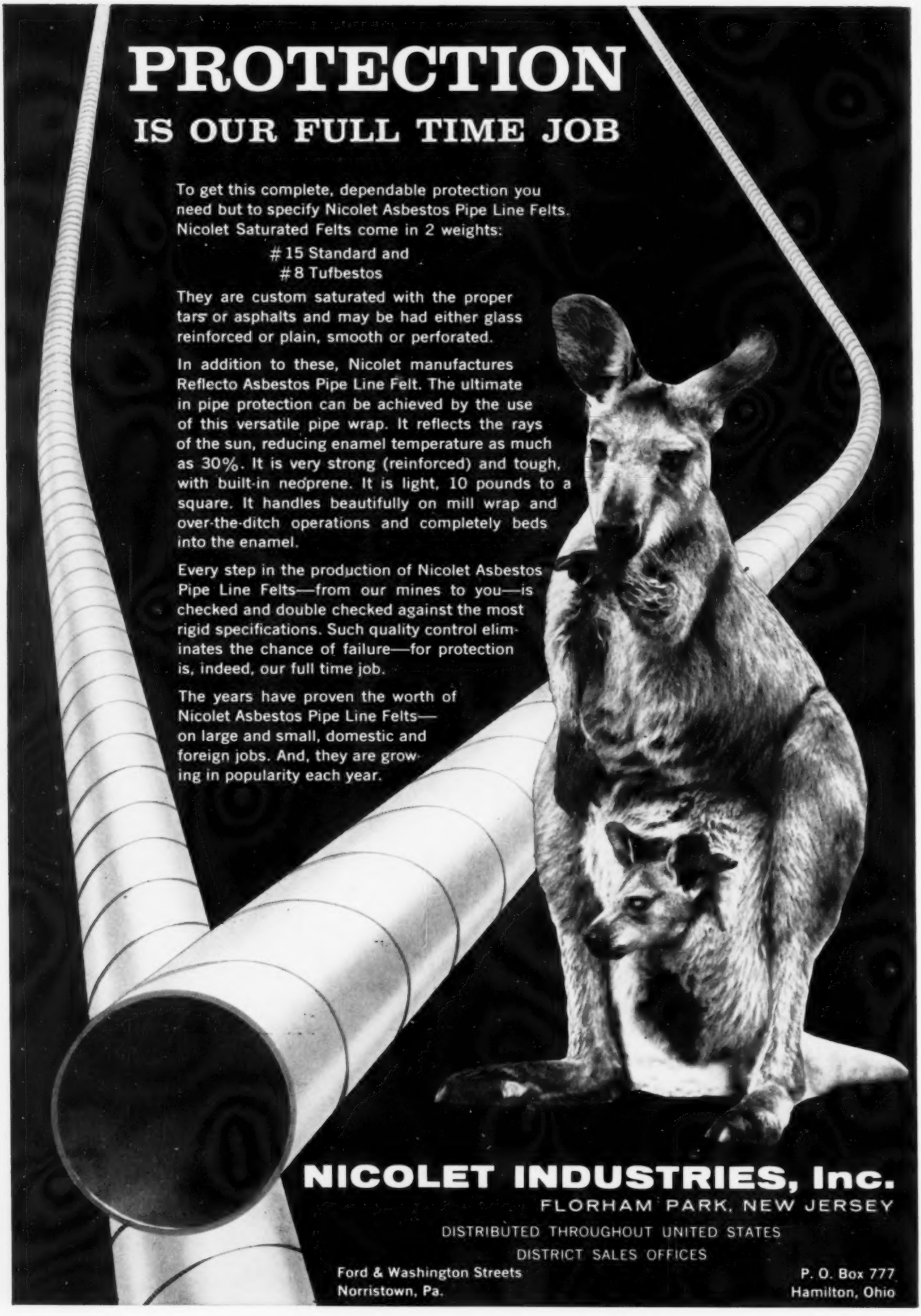
Product of W-K-M's *Creative Engineering*

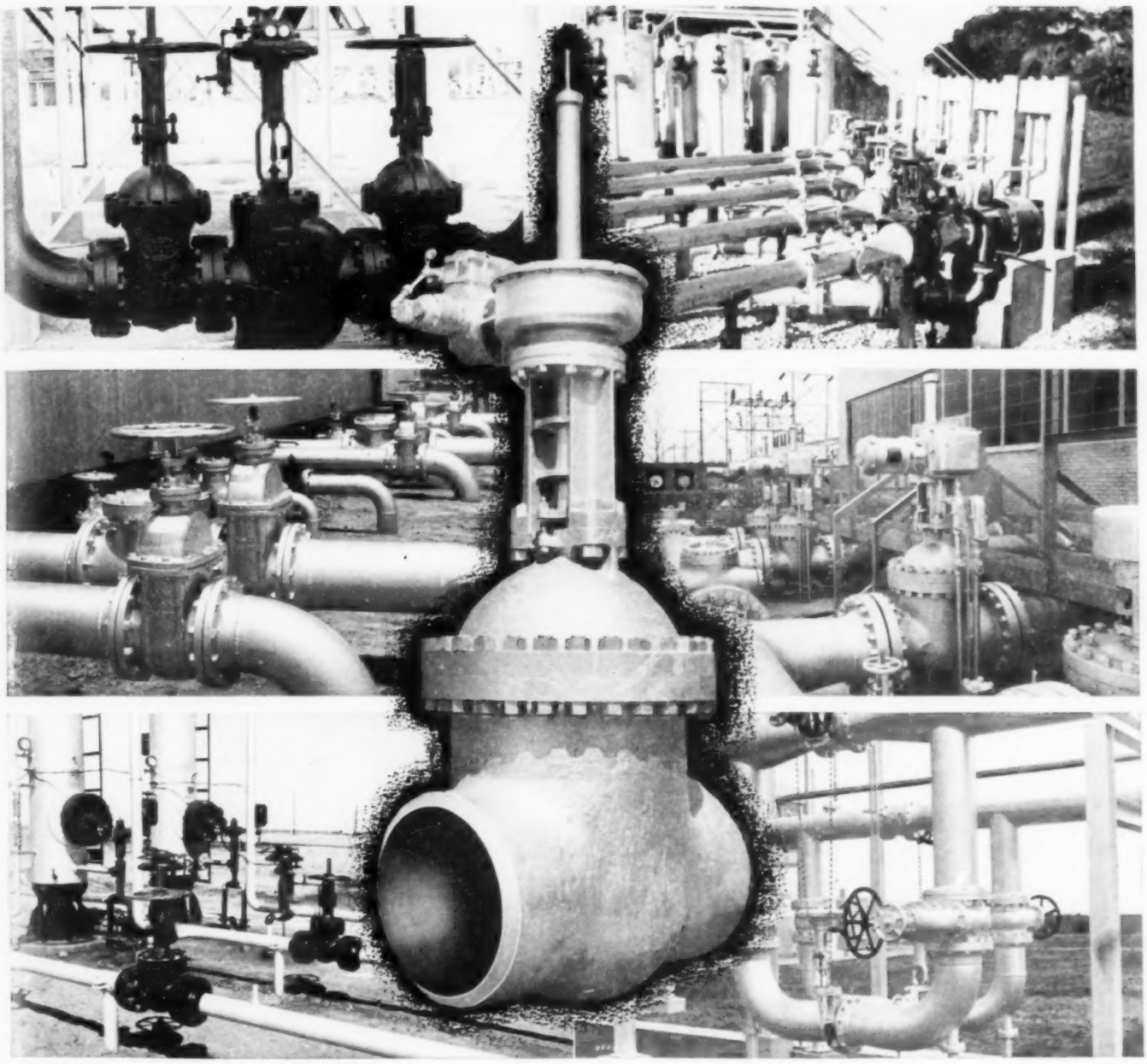
WRITE FOR CATALOG 300
W-K-M Division of
ACF Industries, Incorporated
P. O. Box 2117, Houston, Texas

W-K-M
SERVING INDUSTRY 40 YEARS

5905

1959


PROTECTION
IS OUR FULL TIME JOB
To get this complete, dependable protection you need but to specify Nicolet Asbestos Pipe Line Felts. Nicolet Saturated Felts come in 2 weights:
#15 Standard and
#8 Tufbestos
They are custom saturated with the proper tars or asphalts and may be had either glass reinforced or plain, smooth or perforated.
In addition to these, Nicolet manufactures Reflecto Asbestos Pipe Line Felt. The ultimate in pipe protection can be achieved by the use of this versatile pipe wrap. It reflects the rays of the sun, reducing enamel temperature as much as 30%. It is very strong (reinforced) and tough, with built-in neoprene. It is light, 10 pounds to a square. It handles beautifully on mill wrap and over-the-ditch operations and completely beds into the enamel.
Every step in the production of Nicolet Asbestos Pipe Line Felts—from our mines to you—is checked and double checked against the most rigid specifications. Such quality control eliminates the chance of failure—for protection is, indeed, our full time job.
The years have proven the worth of Nicolet Asbestos Pipe Line Felts—on large and small, domestic and foreign jobs. And, they are growing in popularity each year.
NICOLET INDUSTRIES, Inc.
FLORHAM PARK, NEW JERSEY
DISTRIBUTED THROUGHOUT UNITED STATES
DISTRICT SALES OFFICES
Ford & Washington Streets
Norristown, Pa.
P. O. Box 777
Hamilton, Ohio



Unmatched advantages whatever the service . . . with

Darling Fully Revolving Double Disc Parallel Seat Gate Valves

ALL the Darling gate valves shown here, from the large 30" main line valve to small 4" loading pump valves share identical multiple advantages. They operate with the positive yet easy closure . . . the uniform wear distribution . . . the elimination of disc-to-seat galling . . . the adjustment for valve body distortion . . . the minimum, simplified maintenance and the extended, trouble-free service life made possible by the well-proved fully revolving double disc gate principle perfected by Darling.

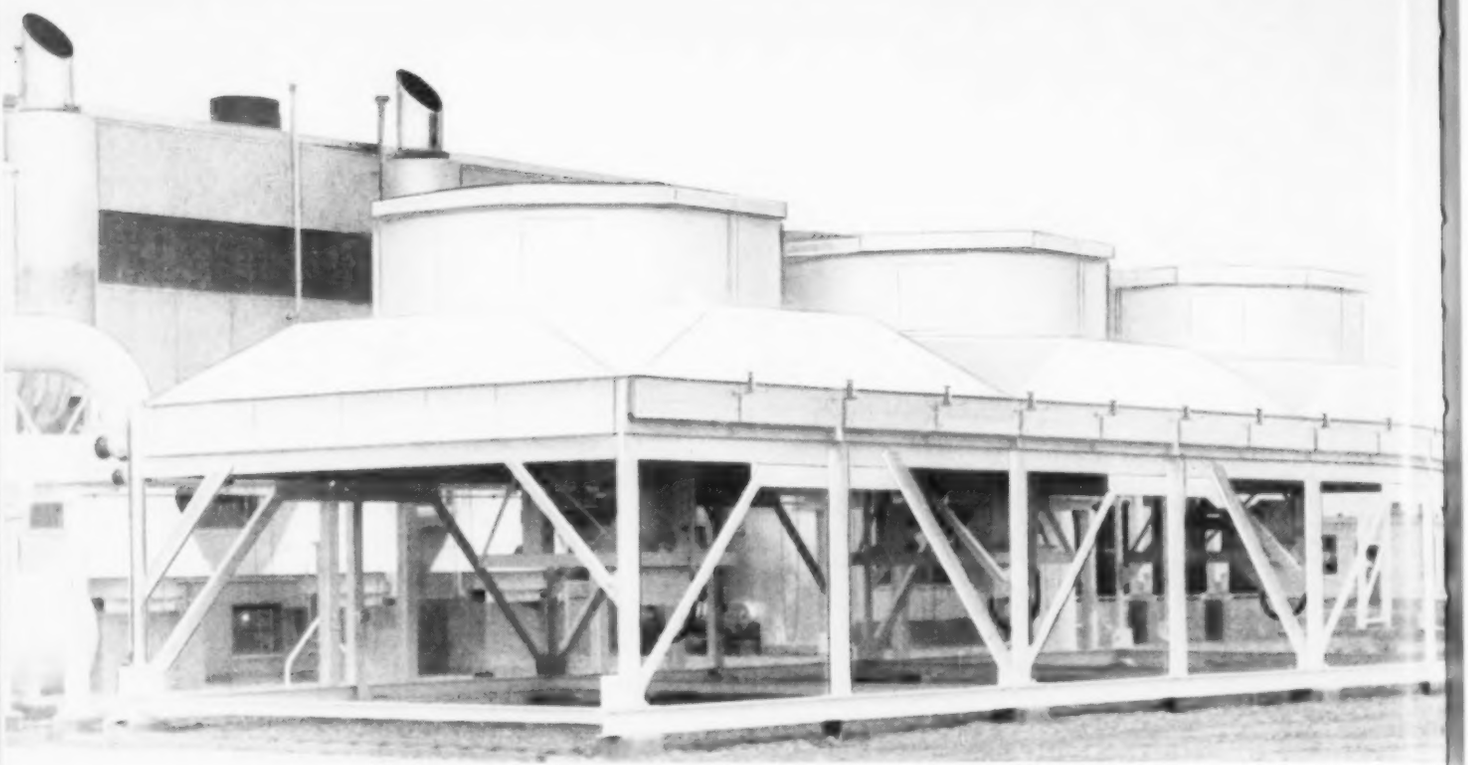
Why not check into Darling gate valves for your next requirements? Find out *how* they assure all these advantages . . . and let us give you proof! Write for Catalog No. 57.

DARLING VALVE & MANUFACTURING CO.

Williamsport 27, Pa.

Manufactured in Canada by Sandilands Valve Manufacturing Co., Ltd., Galt 19, Ontario

DARLING VALVES



Giant compressor and generator engines are cooled by 26 TRANE Fluid Coolers at 6 Trans-Canada stations. Both horizontal and vertical air discharge types are used.

Trans-Canada, longest gas pipeline in the world, chooses Trane Fluid Coolers to cool engine water!

The Trans-Canada Pipeline System—2,294 miles long—provides market outlets for reserves of Alberta natural gas, serves Western Canada, and the great industrial areas of Eastern Canada.

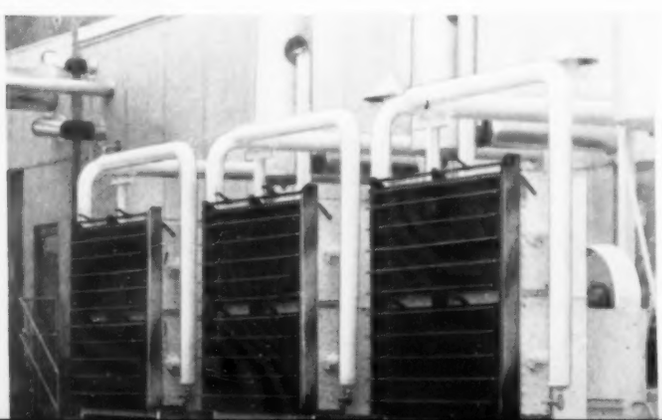
Because this pipeline passes through country where winter temperatures are very low, it was necessary to install engine jacket water cooling equipment that would function at 40 degrees below zero!

Trans-Canada chose TRANE Fluid Coolers for this important job. 26 TRANE units serve the initial six compressor stations. Air cooling was considered essential—and TRANE Fluid Coolers have shown that they can operate efficiently under all weather conditions.

More and more transmission companies are turning to TRANE for cooling equipment. Many have reported simplified maintenance, a minimum of adjustment problems. And engineers *know* that they can depend upon the accuracy and completeness of TRANE capacity ratings—tested in the industry's most complete laboratory, where as many as 90 different temperature readings are taken across the face of a heat transfer section!

When you have a fluid cooling problem, turn to TRANE! Just call your nearby TRANE Sales Office—or write TRANE, La Crosse, Wisconsin.

Small TRANE Horizontal Air Discharge Coolers cool the engines used to drive the 250-kilowatt generators (three per station) which supply electrical power on stations not served by a utility.



For any air condition, turn to

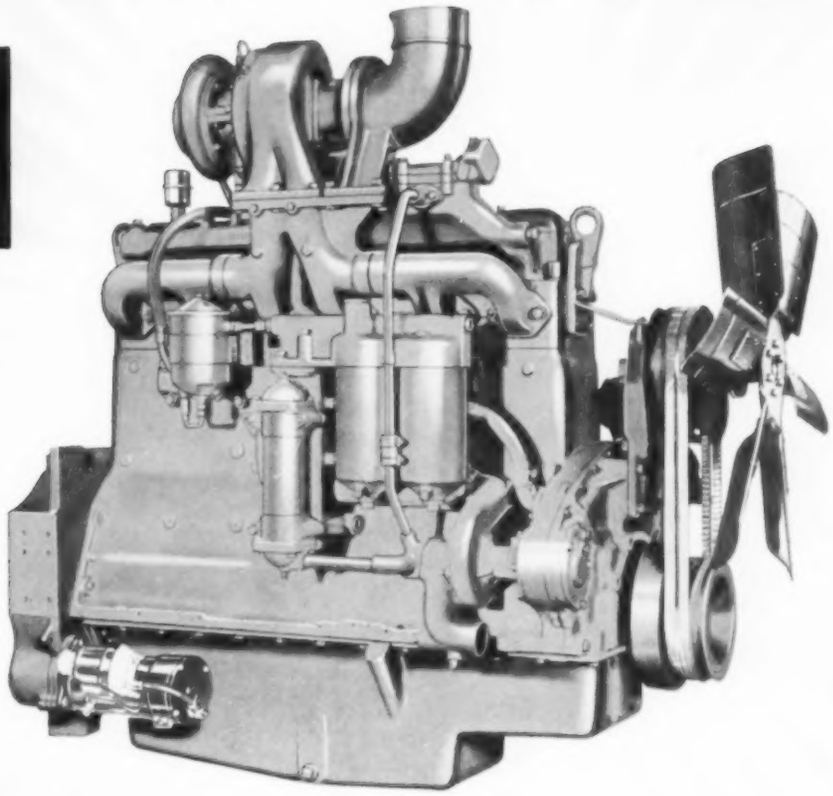
TRANE

MANUFACTURING ENGINEERS OF AIR CONDITIONING, HEATING, VENTILATING AND HEAT TRANSFER EQUIPMENT

THE TRANE COMPANY, LA CROSSE, WIS. • SCRANTON MFG. DIV., SCRANTON, PA. • CLARKSVILLE MFG. DIV., CLARKSVILLE, TENN. • TRANE COMPANY OF CANADA, LIMITED, TORONTO • 100 U. S. AND 19 CANADIAN OFFICES

Most economical diesel

of its kind



The new Allis-Chalmers 21000 saves up to 3 gallons of fuel in every 10, compared with other diesels.

...has stamina to match

Here's the heavy-duty engine that was tested under full load with half the connecting rod and main bearings cut away. It was deliberately run hot and with only partial lubrication. It was operated with intentionally weakened parts and with imbalances. Its stamina was tested far beyond toughest field use to prove that its great economy was more than matched with ability to take it. Hundreds of field reports show the difference between this great engine and ordinary diesels!

The Allis-Chalmers 21000 and the companion 16000 (naturally aspirated) engines run clean, run longer, because of superior, advanced engineering. Get the story of this modern cost-saving power from your dealer. Allis-Chalmers, Milwaukee 1, Wisconsin.

ALLIS-CHALMERS

POWER **FOR A GROWING WORLD**

BE-17

MARATHON

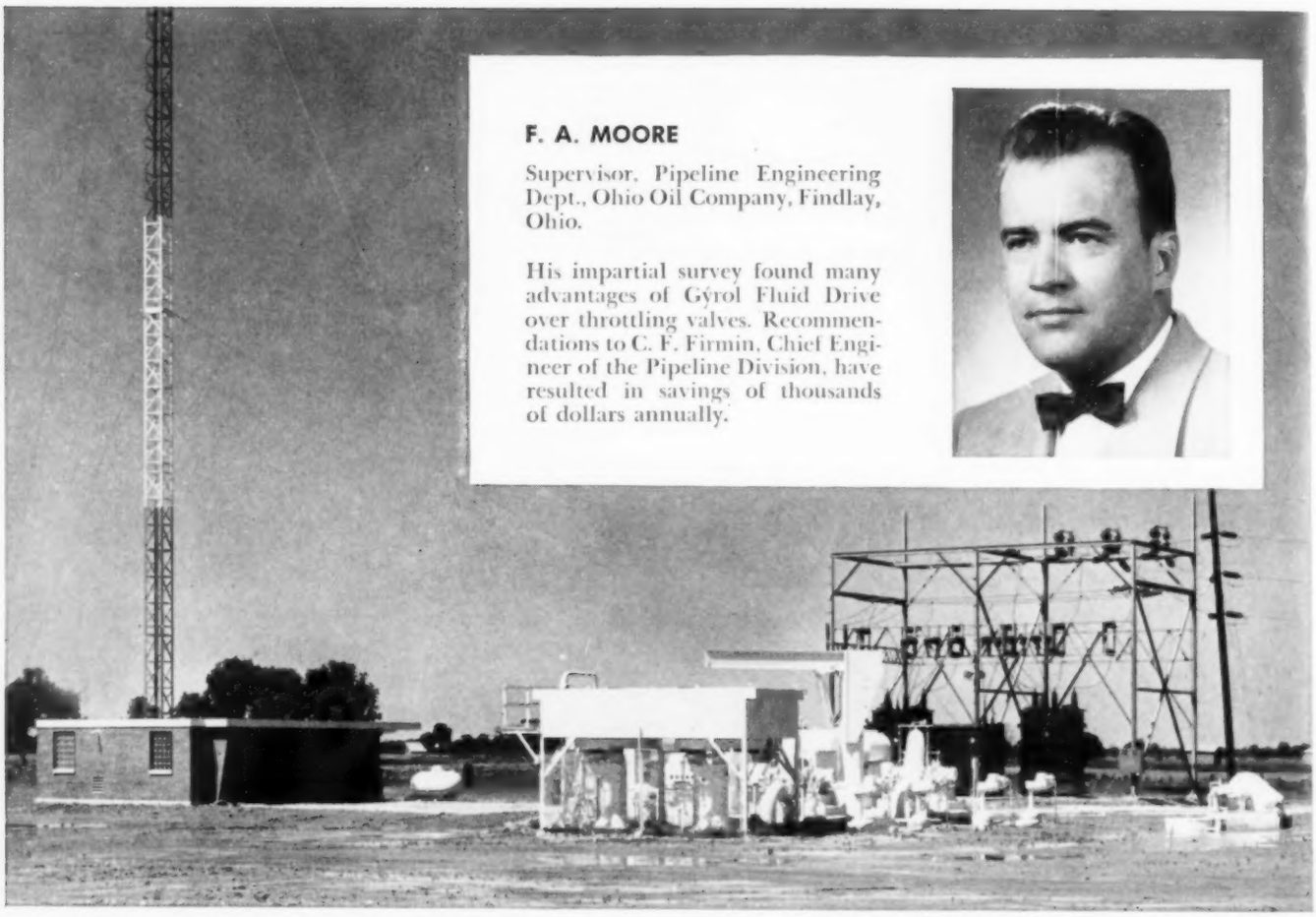
Here's how *Gýrol*® Fluid Drive

REDUCE PIPELINE

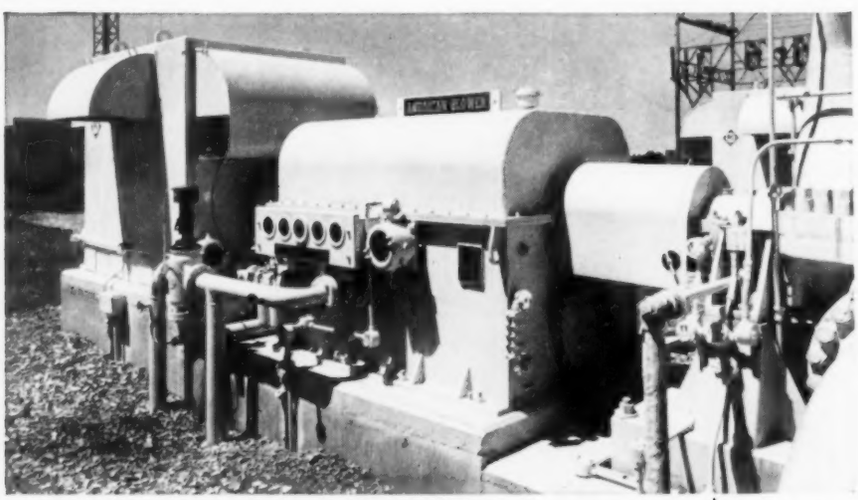
F. A. MOORE

Supervisor, Pipeline Engineering Dept., Ohio Oil Company, Findlay, Ohio.

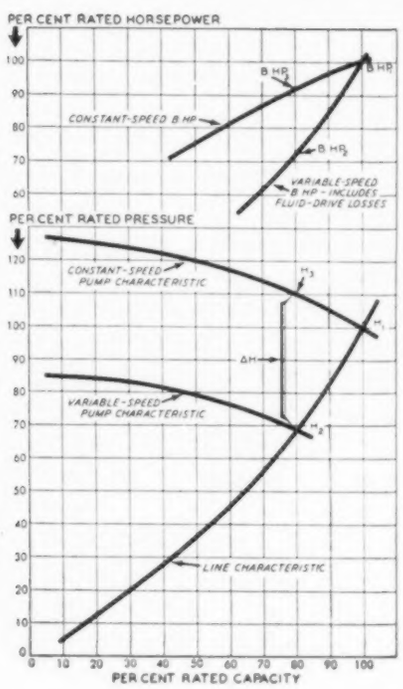
His impartial survey found many advantages of Gýrol Fluid Drive over throttling valves. Recommendations to C. F. Firmin, Chief Engineer of the Pipeline Division, have resulted in savings of thousands of dollars annually.



Ohio Oil's Roachdale, Ind., pumping station.



Gýrol Fluid Drive is installed outdoors at the Roachdale station, an automatic, unattended crude-oil booster station. The unit pictured consists of a 2,500-hp 1,800-rpm motor, a class 6 Gýrol Fluid Drive, and a centrifugal pump.



Graph shows how pump BHP varies as the cube of the speed, while Gýrol Fluid Drive efficiency varies directly as the ratio of output to input speed. Result: major power savings over throttling whenever pump runs below full speed.

helps Ohio Oil Company

POWER COSTS 10%-25%

Adjustable-speed *Gýrol* Fluid Drive saves power; gives complete flexibility of flow and pressure

Power savings of $10,000-$12,000 *annually* have resulted since Ohio Oil Company, Findlay, Ohio, equipped its Jewett, Ill., automatic pumping station with Gýrol Fluid Drive.

Infinitely adjustable in speed, Gýrol Fluid Drive controls flow and pressure in a 10-in. closed-system products line. By eliminating wasteful throttling, it maintains throughput with lowest possible power consumption.

An 8-stage centrifugal pump is driven by a 900-hp, 3,600-rpm induction motor through Gýrol Fluid Drive. This combination brings these operating benefits:

- Single unit provides complete flexibility, regardless of rate of flow required by changes in viscosity or specific gravity.
- Motor starts under no-load conditions, reducing "soft line" demand charges.
- Pressure surges in line are eliminated.

In addition, Gýrol Fluid Drive:

- Holds pressure below design pressure of line.
- Maintains minimum suction pressure.
- Adapts easily to unattended operation.
- Offers dependability proved by hundreds of continuous-duty pump applications.

For full information on the pipeline-pumping savings possible with Gýrol Fluid Drive, talk to one of our sales-engineers. Or write: American-Standard* Industrial Division, Detroit 32, Michigan. In Canada: American-Standard Products (Canada) Limited, Toronto, Ontario.

HERE'S WHERE OHIO OIL COMPANY IS USING *GÝROL* FLUID DRIVE

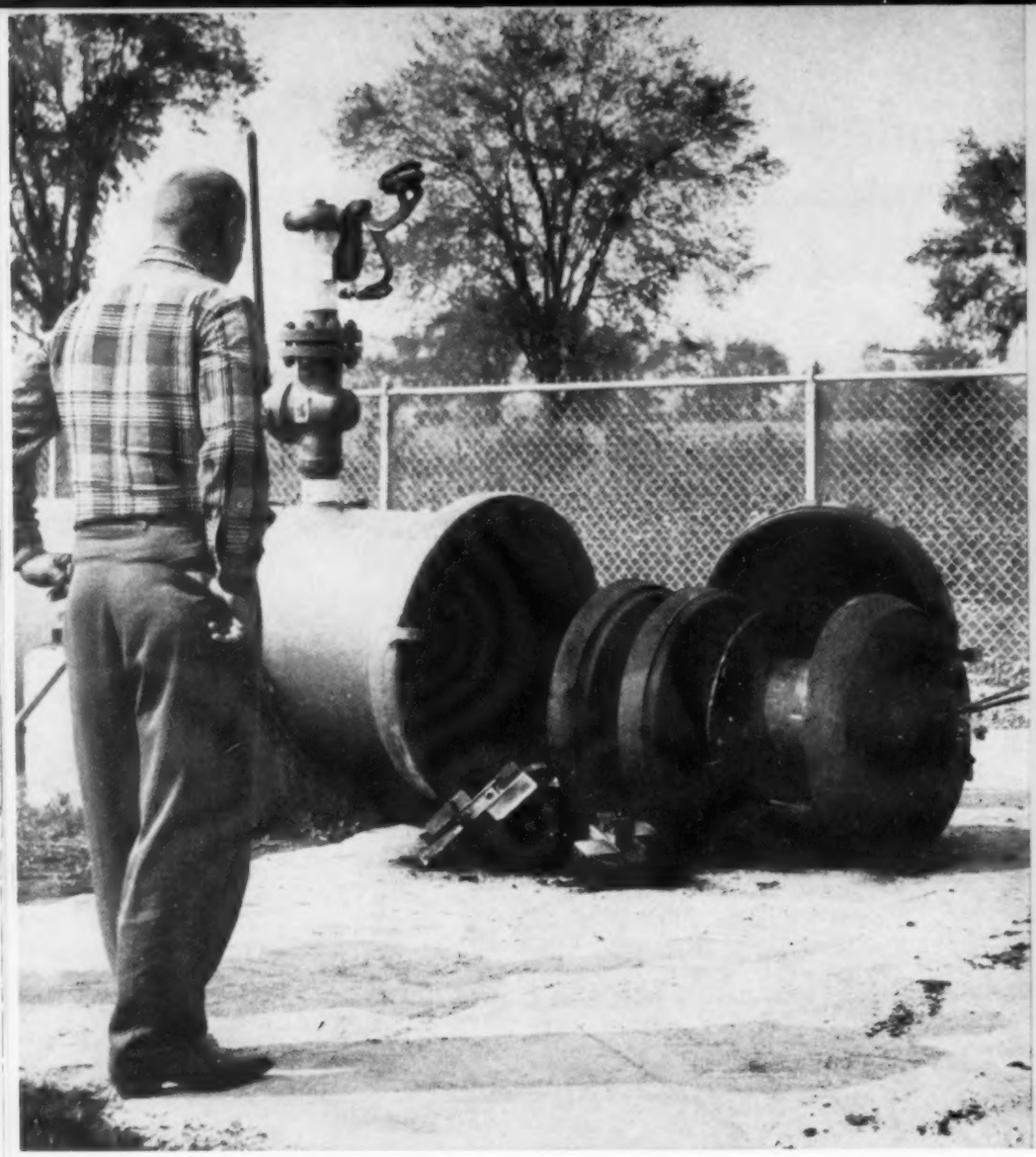
Station	HP	RPM
Wood River, Ill.	900	3600
Jewett, Ill.	900	3600
Robinson, Ill.	1250	3600
Wood River, Ill.	1250	3600
Lake County, Ind.	1250	3600
Roachdale, Ind.	2500	1800
Martinsville, Ill.	2500	1800
Martinsville, Ill.	1250	3600

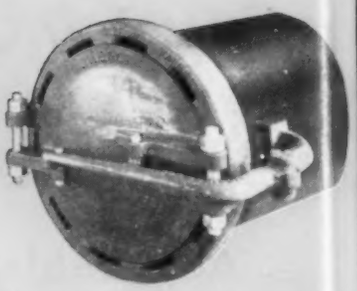
* American-Standard and Standard® are trademarks of American Radiator & Standard Sanitary Corporation.

AMERICAN-Standard
INDUSTRIAL DIVISION

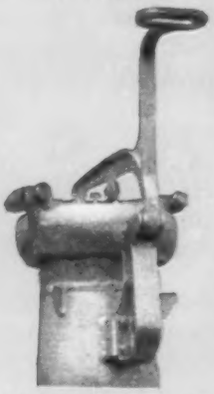
AMERICAN BLOWER PRODUCTS • ROSS PRODUCTS • KEWANEE PRODUCTS

For more data on advertised products, use Readers' Service Cards, last page.





Hinged Type UNIBOLT Scraper Trap Closures conform to ASA 150 through ASA 900 Ratings, and are available in sizes from 4" through 42".



The UNIBOLT Gas Line Blow-Off Head also employs only two bolts and is hinged for easy opening and closing. The closure can be furnished with bleeder plug to safely relieve pressure which may leak through the riser valve.

catch your pig in a UNIBOLT trap!

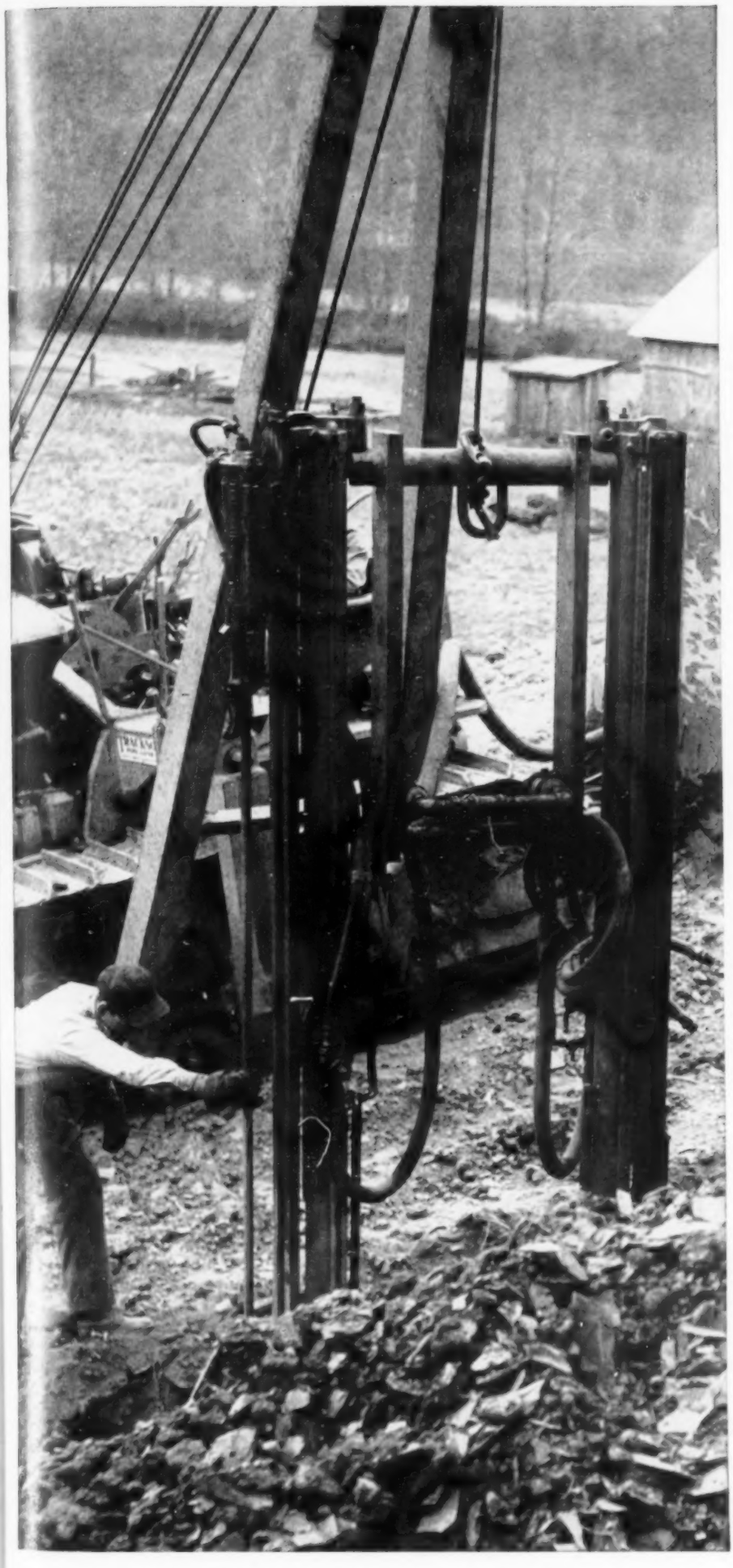
The UNIBOLT Hinged Scraper Trap with self-sealing gasket swings open and shut like a door, and there are only two bolts to release and make up. Nothing to lift, nothing to fall on workmen, no time-consuming multi-bolt flanges, *and no leaks!* The self-sealing gasket, which rarely needs replacing, is the final answer to scraper trap leaks. Its lipped design makes it self-sealing under line pressure. The coupling cannot be over-tightened to the extent of damaging the gasket or the coupling itself.

When installed on an oversize barrel (slightly larger than the o.d. of the pig), it's easy to get a pig in and out of the trap. Line pressure does the heavy work.

These simple, convenient closures are equally desirable for gas line blow-off heads (see above), strainers, product line terminal manifolds, or any other service where pressure vessels must be opened for inspection, cleaning, repairing, connecting to a line, etc.

Please send for Bulletin PL-590 for complete details.

THORNHILL CRAVER CO.
P. O. BOX 1184 HOUSTON, TEXAS



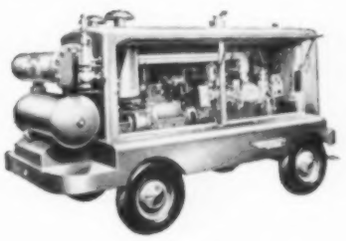
First fully efficient rotary compressor for pipeliners

Puts out full volume with same engine *running 100 rpm slower*

Other "600" rotary compressors produce 600 cfm of air at 100 psi when operating at 1800 rpm. The more efficient Jaeger Roto Air-Plus, using the same economical GM Diesel Model 6-71 engine, delivers the same volume at only 1700 rpm.

This difference in efficiency means that, throughout the longer life of your Jaeger compressor, you will produce air with less fuel, fewer feet of engine piston travel and up to 100 fewer revolutions of compressor vanes every minute of every working day. What's more, you'll find engine and compressor so closely regulated that air pressure remains constant under all normal demands.

For full details, check with your Jaeger distributor or write us for Catalog JCR-8. Find out why the Jaeger "Roto" is the top performer for today's top pipeline contractors.



Model "600". Equally efficient performance is offered in "365" and smaller sizes.

The Jaeger Machine Company, 665 Dublin Avenue, Columbus 16, Ohio. Sales, Rentals, Service in over 150 Cities of U. S. and Canada

JAEGER ROTO AIR-PLUS® COMPRESSORS

Careful supervision of a wide geographical area over 100 miles in length is the watchword at Long Island Lighting Co.

The Long Island Lighting Co., a combination company, strives to maintain a 100% Load Factor, on purchased gas. Naturally, to avoid contract penalties the load variation requires careful supervision of the gas distribution system.

Only one dispatcher per shift controls the distribution system—24 hours a day, 7 days a week. Bristol telemeters put continuous status information at the dispatcher's finger tips: individual flows, pressure of gas at gate stations, amount of gas purchased at gate stations as well as status of the distribution system with pressures telemetered from important points on the Island.

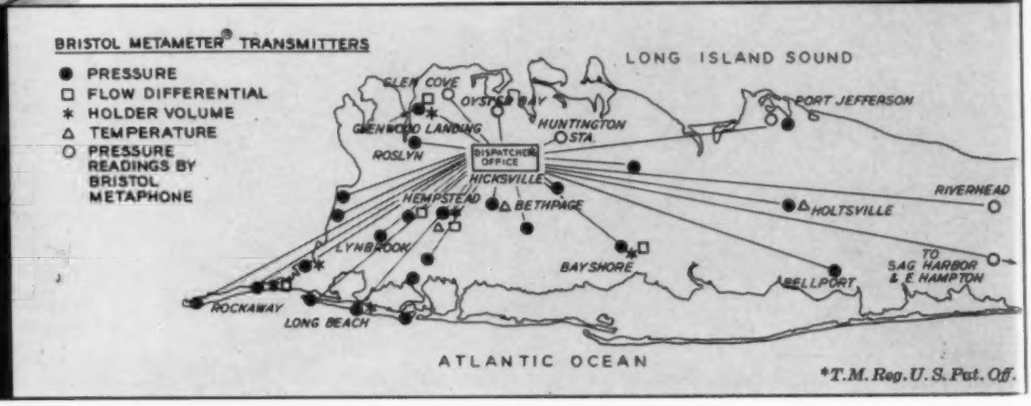
Long Island Lighting anticipates that their gas load will more than double by 1962 and their Bristol instrumentation is flexible enough to take this increased demand in its stride.

Why not find out what Bristol telemetering can do for you? Better pressure regulation during unexpected demand periods, avoidance of contract penalties, security against interruption to service from abnormal conditions are just a few of the benefits you can expect. Distances can be anything from "in-plant" to hundreds of miles. Write: The Bristol Company, 114 Bristol Road, Waterbury 20, Conn.

9.10

BRISTOL TELEMETERING helps maintain load in 105-mile-long gas distribution network

Bristol Metameter* Receivers on gas dispatcher's panel at Long Island Lighting Company's Hicksville, N. Y. Operations Center. These recording instruments make possible precision operation of a distribution network over 100 miles in length (see map).



*T.M. Reg. U.S. Pat. Off.

BRISTOL *TRAIL-BLAZERS IN PROCESS AUTOMATION*
AUTOMATIC CONTROLLING, RECORDING AND TELEMETERING INSTRUMENTS

anti-stalling
anti-rust

GULF agent

Your customers have sure protection against carburetor icing when you stall-proof your gasoline with Gulf Agent 178. For more than four years, this additive has proved itself in millions of cars and billions of miles of service. Gulf Agent 178 is easy to use, because it is readily soluble in all petroleum products and blends easily at temperatures from minus 30° to plus 140° F. It is insoluble in water and can be used in conventional gasoline transfer systems with no danger of loss from water leaching. Gulf Agent 178 is inexpensive, too. Only 10 to 15 pounds are required per thousand barrels of gasoline. No expensive storage space is required, since quantities are so small. Lastly, Gulf Agent 178 gives you an extra benefit by providing corrosion protection at no extra cost. Rust prevention lengthens the life of distribution and storage facilities all the way from refinery to customer. Gulf Agent 178 can make your gasoline a better, more saleable product. Let us show you how. Write or phone Petrochemicals Department Sales Office, Gulf Oil Corp 360 Lexington Ave. New York 17, N.Y.

GULF

Quality Chemicals from Petroleum

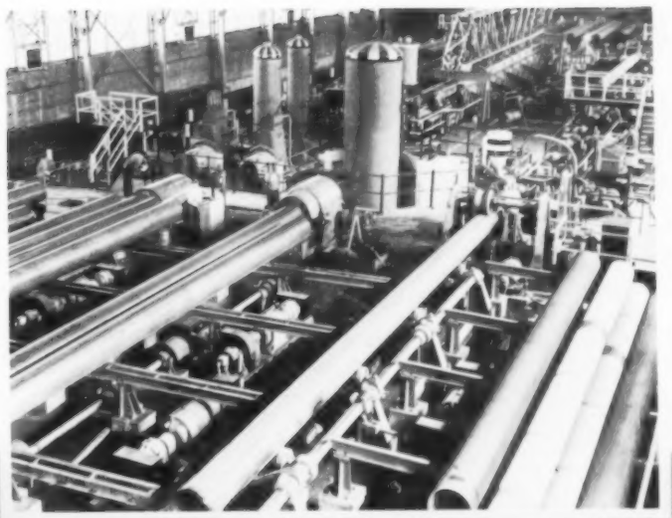
There's no better pipe than Y

More and more pipe buyers are simplifying and speeding up line jobs by specifying Youngstown Electric Weld. It possesses excellent line up characteristics, welds easily and its long lengths save time and trouble. For more information about Youngstown Electric Weld Line Pipe contact our sales and service offices throughout the oil and gas-producing country.

The Youngstown Sheet and Tube Company,
Youngstown 1, Ohio.

n Youngstown in any line!

All Youngstown Electric Weld Line Pipe, 12¾" and larger, is full-length hydrostatically expanded to more uniform roundness. In this operation, internal water pressure forces the pipe out against the solid walls of a mantle. This increases its strength and enlarges the diameter . . . both of which make line up and welding a far easier job in the field. Final proof tests such as these are reasons why there's no better pipe than Youngstown on any line!



QUALITY YOUNGSTOWN SERVICE

Youngstown

ELECTRIC WELD LINE PIPE

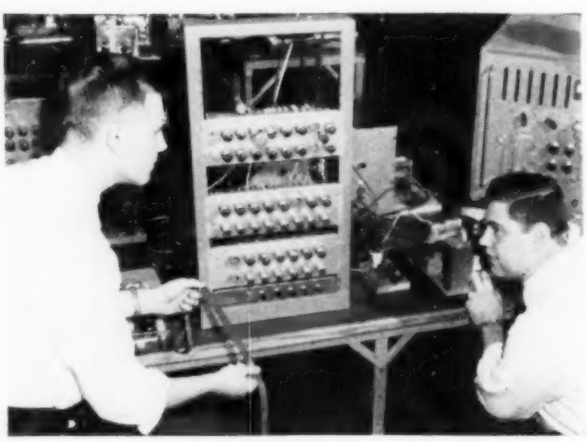
THE U.S. TREASURY SALUTES THE COMMUNICATIONS INDUSTRY

--and its people who buy Savings Bonds and strengthen America's Peace Power

The hundreds of thousands of Americans who earn their living at work with the telephone and telegraph industries are proud of the scope and skills of their service in local and worldwide communication. They're proud, too, of the vast and varied help their industry is giving to our national security.

Thousands of these telephone and telegraph people have a personal hand in building up America's Peace Power, too. They do this by purchasing U. S. Savings Bonds. Their regular purchase of Shares in America helps these patriotic people to reinforce their own security after retirement and to establish current reserves for such sound family projects as new homes and higher education.

It may be that your company has not recently shown your employees the advantages of buying bonds on the Payroll Savings Plan. If so, why not conduct a person-to-person canvass now? Contact your State Savings Bond Director for Payroll Savings promotion materials and personal assistance. Or write to the Savings Bond Division, U. S. Treasury Department, Washington 25, D. C.



Like so many thousands of their fellow craftsmen in the industry, these young employees are making regular use of their company's Payroll Savings Plan to contribute to America's Peace Power.

PIPE LINE INDUSTRY

THE U. S. GOVERNMENT DOES NOT PAY FOR THIS ADVERTISEMENT. THE TREASURY DEPARTMENT THANKS, FOR THEIR PATRIOTISM, THE ADVERTISING COUNCIL AND THE DONOR ABOVE.

PIPE LINE PANORAMA

Pipe Line Construction to Increase . . . FPC paved the way for a new upsurge in pipe line construction during early August, giving the green light to nearly 5,500 miles of projects. Total cost: About $410 million. Major approvals in brief:

- **Transwestern** will build 1,809-mile, $191.7 million gas line from Texas Panhandle to Arizona-California border. Starting date will be delayed. Reason: Transwestern has announced plans to request FPC to ease demands that sharp price cuts of 1 to 6 cents per Mcf be made in prices paid producers. FPC also will be asked to reconsider stiff tariff revisions included in the approval.
- **Northern Natural** is building 430 miles of 20, 24 and 30-inch line, also 2,178 miles of branch lines and 57,400 hp in additional compressor capacity to extend gas service to 342 Midwest and North Central communities.
- **Southern Natural** is constructing 590 miles of various diameter loop lines. Total cost: $52 million. South Georgia Natural Gas will connect 103 miles of lateral lines to Southern Natural project at cost of about $2 million.
- **Texas Gas Transmission's** $40 million expansion program to construct 246 miles of line and add 15,760 hp compressor capacity is underway. Project includes 165 miles of 30-inch and 81 miles of 26-inch loop lines in Louisiana, Kentucky, Mississippi, Tennessee, Arkansas, Ohio and Indiana (See Page 82).

Three Pipe Lines in One . . . One of the most unusual pipe lines ever constructed is nearing completion off Grand Isle, La. To move 4,500 tons of molten sulfur daily from its offshore mine, Freeport Sulphur Company will use 7-mile, 6-inch submarine line inside 7⅝-inch hot water jacket line. Lines are inside 14-inch casing to insulate them from surrounding soil. (See Page 40).

Washington Panorama . . . FPC has set October 15 hearing date on Pacific Gas Transmission Company application to construct 614-mile, 36-inch line from the Canadian border to California at a cost of $129 million . . . **Also up for consideration this fall** is Midwestern's request to purchase natural gas from Trans-Canada Pipe Lines, Ltd., for import into U.S. . . . **Last month, FPC allowed initial base rates up to 21.5 cents per Mcf** for Louisiana and Mississippi gas. These approvals are expected to spur more than $100 million of pipe line construction to move Gulf Coast reserves to consumers. New rate approvals were slightly higher than 21.4 cents proposed in hotly disputed Supreme Court ruling in CATC case . . . **American Gas Association reports gas utility and pipe line industry operating revenues** totaled $7.35 billion during 12 months ending last March 31, up $670 million or 10 percent over previous 12 months. However, operating expenses increased $428 million, or 9.4 percent during same period. AGA also reports that transmission construction budget for 1959 will total $807 million. Expenditures for period from 1959 to 1961 will amount to $3.5 billion.

Look for Greater Use of Computers in Pipe Line Control . . . Recent improvements in transistorized digital computers have increased their value in pipe line control.

Advantages: Use of analog and digital computers reduces personnel requirements at each station—may give dispatcher direct control over station without having to bother with details of individual station operation—allows main office push button control—increases efficiency of operation—can save on fuel.

Disadvantages: High equipment and instrumentation cost—requires highly technical maintenance—may be difficult to install on old systems.

Six-inch molten sulfur carrier is jacketed by 7⅝-inch hot water line. This string was insulated and rolled into a 14-inch casing. Two piggy-back water pipe lines completed the bundle pulled to mine off South Louisiana

Biggest part of the Freeport Sulphur line construction was the necessary detail work prior to pulling the lines. This aerial photo shows the 2,000-foot graded and shelled pipe workway extending back from the Gulf near the eastern end of Grand Isle. Launching platform at the tide line sloped toward the Gulf to provide proper curvature of the pipe as it entered the water.

Three Pipe Lines in One Laid Seven Miles into Gulf

By Melvin A. Judah, Editor
Donald G. De Pugh, Construction Editor
PIPE LINE INDUSTRY

ONE OF THE most unusual pipe lines ever constructed is nearing completion off Grand Isle, La. To move 4,500 tons of sulfur per day from its offshore mine, Freeport Sulphur Company decided upon a submarine pipe line to carry molten sulfur; it is jacketed with hot water conduit and both are insulated from the surrounding soil by a 14-inch casing having 2¼-inches of asbestos insulation in the annulus.

In addition to assembling the three lines in one, Sharman, Allen, Gay & Taylor, Inc., also pulled a 4½-inch hot water return line and 6⅝-inch cement lined fresh water pipe line strapped to the outside of the 14-inch

casing. Work on the line began in May with the actual pulling and testing taking place in late July and early August. The line is due for completion this month.

Freeport's $2.1 million pipe line is a part of a $30 million investment to tap the Grand Isle sulfur deposit discovered by Humble Oil & Refining Co. This deposit is reportedly the third largest ever discovered in the U.S.

Laying methods. Prior to starting assembly of the pipe lines Sharman, Allen, Gay & Taylor graded and shelled a 2,000-foot workway extending back from the Gulf near the eastern end of Grand Isle. This 200-foot wide pipeway was located alongside a launching platform which sloped toward the Gulf.

Five lines were welded into 1,000-foot lengths on the pipe workway; after assembly, each section was hydrostatically pressure tested. Following pressure tests and purging water, the 6-inch sulfur line was inserted into the 7⅜-inch hot water jacket line. Around the jacket water line a 2¼-inch thick asbestos thermal insulation was fitted to the pipe and banded on.

Steel collars with ball bearing roller assembly were then installed every 19 feet-6 inches along the line and the entire assembly was rolled into the grease lubricated 14-inch casing.

Next assembly step was to "double joint" the 1,000-feet lengths into 2,000-foot units. Again, the two inside lines were hydrostatically pressure tested in 2,000-foot sections. Seventeen 2,000-foot strings were made up in this fashion prior to the start of pulling operations.

Special weld and bevel. To meet stress conditions anticipated on the inner "hot lines," steel with a yield of 60,000 psi was specified. It was the first time that this steel had been rolled by the mill for pipe line service. To eliminate danger of icicles inside pipe a special pipe line welding method was used. Design engineers specified a mechanically cut J bevel.

Ends of the 6-inch, 0.288-inch wall, sulfur carrier pipe were buffed to bright metal; a solar flux mixture in methyl alcohol was painted on the inside of the pipe extending 1-inch back from the joints. Joints were butted directly together with no space and the 1/16-inch land of the U

This "nose cone" assembly was the leading end of the 7-mile offshore sulfur line. It provided a means of pulling the lines and placing them in tension after the pull. It also anchored the inside sulfur and jacket water lines on the seaward end and provided a connection for the riser stubs. Steel piling "channel" near beachline prevented sloughing of sand and backfilling of the ditch prior to the pull. Offshore platform and clam shell barge may be seen in the distance at the left.

Stub end of sulfur carrier line is cut smooth after insertion of the string into the jacket water line. A special J bevel was used for welding the 60,000 psi pipe. For the stringer bead, joints were butted directly together and fused.

Contractors and Consultants on Freeport Sulphur Job

Sharman, Allen, Gay & Taylor, Inc.—Prime pipe line construction contractor

Brown & Root, Inc.—Assisted in feasibility studies; erection of living quarters platform, building and bridge span for heliport

Texas A & M Research Foundation—Aided in oceanographic studies

J. Ray McDermott & Co., Inc.—Marine contractor

Levingston Ship Building Corp.—Living quarters structure and power plant

Metal Building Products Co.—Living quarters

Dedell and Nelson—Consulting Engineers in offshore structure design

Pipe Line Service Corp.—Coating contractor

Corrosion Rectifying Co.—Cathodic protection contractor

Nash C. Roberts, Jr.—Weather consultant

Shilstone Testing Laboratories—X-ray contractors

A. H. Glenn & Associates—Wind and wave forces design criteria for offshore structures

Eustis Engineering Co.—Test boring and pile load determinations at offshore site

Sargent & Lundy—Power plant design

Moran Towing & Transportation Co.—Over-all feasibility study of offshore transportation

"Invent it Yourself" dolly was developed by contractor's foreman to thread 6-inch sulfur carrier into 7⅝-inch conduit. Special securing collar which keeps the 7⅝-inch pipe from rolling longitudinally when the complete string of 14-inch casing and assembly is moved may be seen in background.

groove was completely fused by an argon gas shielded arc welding process. Rods were heated to 150° F in an oven at each weld station.

This same welding method was followed for the first pass using a special rod for filler metal. The first hot pass was made with conventional arc welding and low hydrogen rods. Two filler passes were made with low hydrogen rods; a cap pass completed the welding procedure. For welding the 7⅝-inch, 0.328-inch wall high-strength jacket water pipe, the same method was used except that three filler passes were made with the low hydrogen rods.

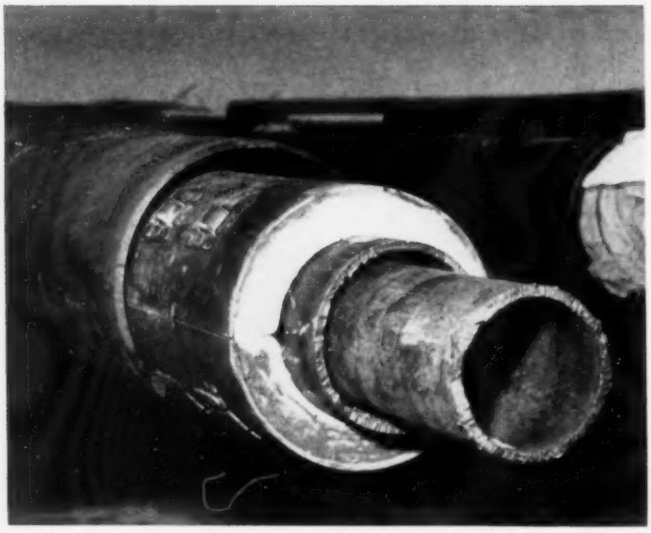
Welding of the 14-inch casing and the 4-inch and 6-inch "piggy-back" water lines was done by conventional welding process. A 30° bevel was used on the outside lines. The 14-inch bell and spigot casing has a yield strength of 42,000 psi. Welds on the casing were fillet welds with the bell opening toward the shore.

Rate of progress in welding and assembly of the pipe lines moved well after initial "shake down" of the welding techniques. One 2,000-foot segment was completed every two days. More than 5 tons of welding rods

All welds on all five of the pipe lines were X-rayed. Following initial "shakedown" with the welding methods, there were very few cut-outs after inspection.

An unusual welding technique for pipe line construction was used on the Freeport Sulphur "hot lines". Inert argon gas shielded arc welding was used for fusing the directly butted lines together and for the hot pass. Filler passes and the cap weld were by conventional methods with low hydrogen rods.

Special insulation was specified for the 7⅝-inch hot water line. A 2¼-inch layer of asbestos insulation was fitted to the jacket water line and banded on. Every 19 feet 6 inches a special roller bearing sleeve was installed. Here a jack and chain clamping device holds the sleeve in position as it is ready to be tack welded. A sodium-silicate, fibrous asbestos cement was used to fasten the insulation to the line at the roller brackets.



Close up of the roller bearing sleeve shows how the two inner lines fit into the 14-inch casing. Roller bearings were grease-packed and the sleeves tack-welded on over the insulation. Dried air from the instrument system treated with a vapor phase inhibitor will be fed into the insulated annulus to provide a pressure of 1,000 pounds per square inch.

Inside of the 14-inch casing was swabbed with a high temperature grease prior to welding. Design of the roller bearing support and greased casing facilitated construction of the line with a minimum of drag and will permit longitudinal movement as the inner lines are heated up and expand.

were used on this seven-mile pipe line job.

Applying insulation. For most cross country pipe line contractors, insulation on a line amounts to coating and wrapping it or perhaps an additional application of concrete weight coating in submarine work. But for the Freeport sulfur line a precise job of applying insulation and securing it to the outside of one line and getting it to fit smoothly into a seven-mile annulus called for some real ingenuity; the 2¼-inch thick asbestos thermal insulation had to be applied to the clean dry surface of the jacket water pipe. At 19-foot 6-inch intervals an 11⅝-inch I.D. by 18-inch pre-insulated roller bearing support sleeve minimized friction during insulation and allows for longitudinal expansion or contraction between the lines.

Insulation of the roller support sleeve was glued to the pipe with a mixture of fibrous adhesive and sodium silicate. Bearing support plates were installed by means of clamps consisting of chain binders and jacks to insure tight fit of the insulation around the pipe. Each bearing support plate was tack welded at the split.

Each of the lines was pressure tested in 1,000-foot sections, again in 2,000-foot strings and also when finally pulled into the ditch. Here a test pressure of 1800 psi is applied during hydrostatic test of the jacket water string.

Inspection and testing. Every weld on all five pipe lines was X-ray inspected. In addition, each 1,000-foot section of pipe line was hydrostatically tested. After assembly of the 1,000-foot-triple lines into 2,000-foot strings the sulfur and jacket water lines were again pressure tested.

Test pressures of 1,350 psi were used on the 6-inch sulfur carrier and 1,800 psi on the jacket water line; the insulated annulus was also pressure tested with dry air at 1,500 psi following launching. For extra safety the complete pipe lines were pressure tested after pulling into the ditch.

No corrosion inhibitor was used in the test water. However, all lines will be flushed with potable water, treated with caustic soda and sodium sulfite to provide an alkalinity in excess of 400 parts per million and a residual sulfite concentration of 100 parts per million.

In service, the insulated annulus will be pressurized to about 1,000 psi with dry air supplied by the instrument air system at the sulfur mine platform. Air will be treated with a vapor phase corrosion inhibitor before being injected into the annulus.

Corrosion protection. All lines exposed to sea water or mud bottom

were coated and double wrapped with a high temperature specification coal tar coating and fiber glass wrap. In addition, the first 1,000 feet of casing on the Grand Isle end has a 1-inch thick concrete coating. This was primarily to increase drag once the spoil had backfilled around the pipe in the ditch. The 6-inch fresh water supply line to the mine is cement lined.

The entire pipe line assembly will be protected by a cathodic protection system installed at the platform.

How the lines were pulled. Complete oceanographic and bottom soil studies were made prior to marking the right-of-way on one-mile centers. Clam shell dredges cut the trench from Grand Isle to the offshore platform.

The pipe line, some 33,700 feet of which will be in the water, was pulled from the Grand Isle launching platform into the dredged ditch by a barge-winch assembly in 2,000-foot increments. In all, 17 such joints were pulled during construction.

Orginal plans called for banding 2,000-foot sections of 16-inch flotation pipe atop the assembled lines for buoyancy. However, it was found more practical to use 366 feet of 16-inch pipe alternated with 109 feet of unsupported line to control negative buoyancy; this was the system actually used for best control of pipe string during pull of the line. Supporting bandings for the pontoon pipe sections were removed by a diver after completion of the pull.

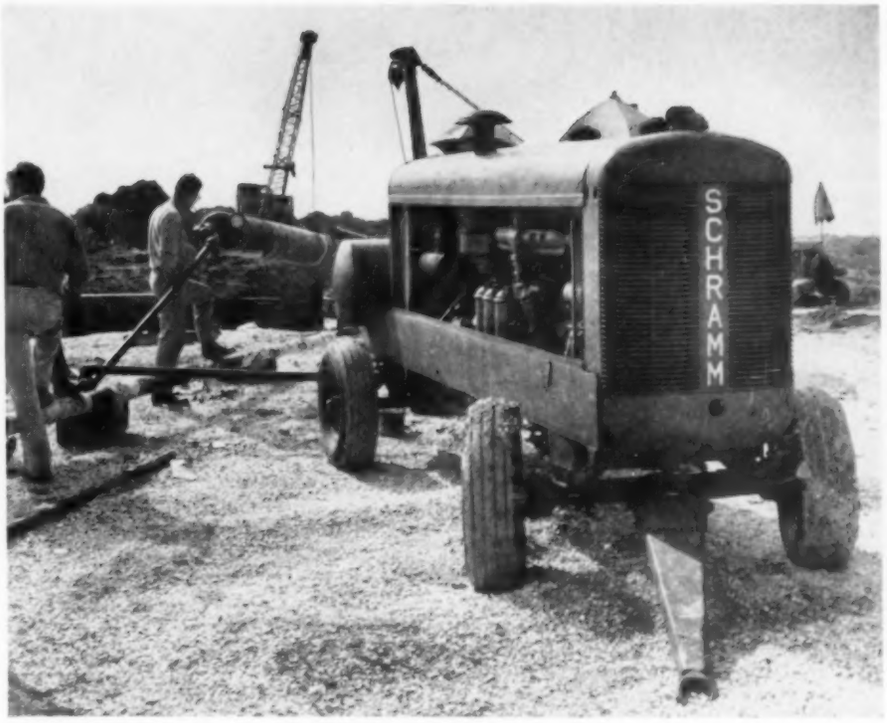
Sheet pilings were driven several hundred feet out from the Grand Isle tide line to prevent sloughing and inwash of sand into the dredged ditch. The depth of the line will be 45-feet below mean low Gulf at the mine with a minimum of 3 feet of cover. The shore section of the line at Grand Isle will be buried 6 feet below mean low Gulf.

First section of pipe on the seaward end consisted of a special "nose cone." This assembly provided a means for anchoring the various lines and fitting them to the riser piping at the platform. Both the sulfur line and the hot water line were anchored to this seaward end assembly. The 14-inch casing is swaged out to a larger pipe and ultimately to the sides of the "nose cone."

The "nose cone" assembly also provides for air supply lines, hot water lines to the heat exchanger in the riser system and special pad eyes for attachment to the pulling head.

Actual pulling operations began on July 17 and ended on August 3. During the pull, work was held up for five days because of high winds and the waves resulting from effects of hurricane Debra in the Gulf.

After the line was pulled, its sea-



Air pressure tests were used on the insulated annulus. Here the line is pressured up after the complete string had been pulled into the ditch and prior to post tensioning of all the lines.

Special pulling collars were welded to the 14-inch casing and piggy-back water lines. These were used to apply tension to the completed string after the pipe was in the ditch. Upon completion of this assembly a hydraulic jacking system was used against a steel piling dead man at the Grand Isle launching site to take slack out of the line and tension all three of the external lines. The engineering design of the line calls for all lines to be in compression after they have reached normal operating temperatures.

The pulling head for applying tension to the shore end of the Grand Isle line is being threaded over the casing and two piggy-back lines. Below the lines is the steel piling dead man against which tension was applied with a jacking system.

Collars of the three lines are snubbed up against the pulling head in preparation for applying tension to the shore end. Using a similar system, cable tension was applied to the offshore platform end of the line against a steel piling driven to refusal a short distance back of the riser structure.

ward end was attached to a system of cables and a pull of 250,000 pounds (equivalent of 10,000 pounds per square inch) was applied. This tension is to be held by a system of locking devices anchored to a steel piling driven to refusal into the sand strata a short distance away from the riser structure.

Similarly, a pull was also made against a steel piling dead man on the Grand Isle base by a system of hydraulic jacks pulling on welded collars attached to the 14-inch casing and the two piggy-back lines. Sand on the beach and normal backfill by the sea will provide skin friction to anchor the line after completion of installation. The rough cement coating on the 1,000 feet on the shore will help to provide friction to anchor the system in tension.

Stress factors. Heating up of the molten sulfur and jacket water lines would cause an expansion of about 55 feet when heated from 75° up to the 300° operating temperature. For this reason the inner lines will remain free until they have reached approximately the operating temperature; then they will be anchored off at the shore end and tied in to barge loading facilities through shore expansion loops.

Freeport's design engineers predict that when the lines are placed in operation and reach a normal operating temperature the thermal stress in the lines will be in compression; combined stresses will be only about 60 percent of yield strength.

If for any reason the inner line should be cooled to atmospheric temperatures, the thermal stress would be reversed to tension and combined stresses calculated to be about 70 percent of yield. Anchoring structures for the external lines should be needed only temporarily. After the soil becomes stabilized around the line, soil resistance is expected to be adequate to prevent movement of the casing.

How the line will operate. Sulfur produced from the offshore Grand Isle mine will move through the terminal installations at Grand Isle to storage and loading facilities at Port Sulphur, La. Several methods were considered in planning the Grand Isle sulfur mine installation.

Freeport's engineers realized that transportation of the sulfur from off-

shore would be affected by weather at the exposed location plus the high cost of building storage and loading facilities off Grand Isle. Methods considered included a sulfur line direct to Port Sulphur either carrying the sulfur molten or as a sulfur-water slurry and then reclaiming it. Other possible alternatives were an aerial tramway to Grand Isle or use of conventional liquid sulfur barges or tankers from the offshore location. After feasibility studies of these various choices it was decided that the most economical, reliable and practical all-weather means of moving the sulfur would be by pipe line to Grand Isle in a molten state and then by liquid barges on to Port Sulphur through sheltered canals.

Liquid sulfur will be carried in the 6-inch inside line. Treated super heated water will flow through the 7⅝-inch jacket line to keep the sulfur temperature up from mine to the land. The heating water will be cooled at Grand Isle and sent back to the mine in the 4½-inch piggy back line.

Temperatures of both sulfur and water at the mine will be approximately 320°; exit temperatures at Grand Isle will be about 280°. This top temperature is optimum for pumping of molten sulfur; temperatures below 280° might allow the material to approach freezing at some points in the line. The heating water will be cooled to a temperature of about 150° at Grand Isle.

Facilities at Grand Isle will include a barge loading wharf, other loading facilities, plus a small heating plant. In the event of a shutdown at the offshore facilities the heating plant will be used to recycle jacket water and prevent the sulfur from solidifying. The entire sulfur line could be pigged if necessary. All of the lines were pigged during assembly. No anchors or spacers are provided between the sulfur carrier line and the hot jacket water line except at the terminal ends.

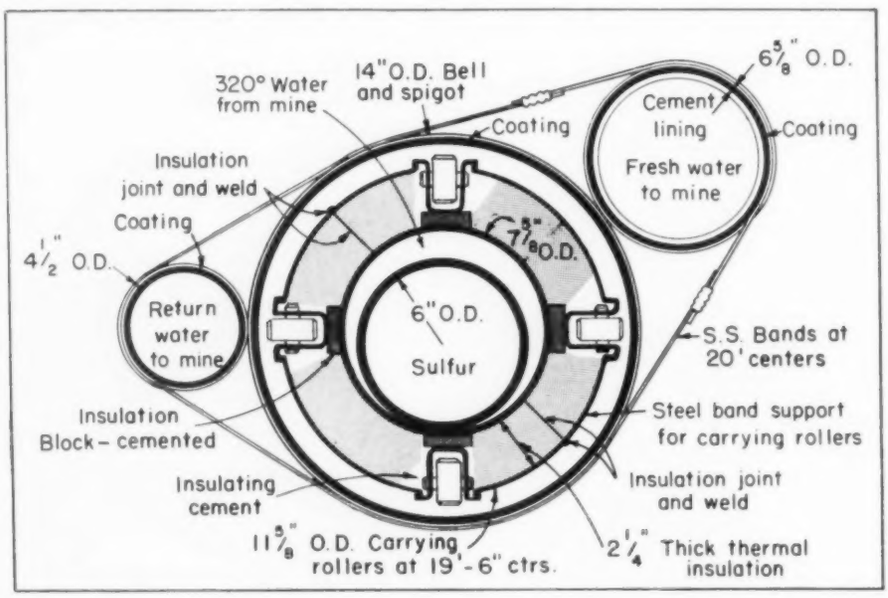
Heat loss. Efficiency of the insulation and air gap between the 7⅝-inch jacket water line and casing are expected to be well within design limitations. An ocean floor soil temperature of about 75° would allow the casing to heat up to about 110° F. Heat loss to the wet soil would amount to only about 90 Btu per linear foot. This would be about 75 million Btu's per day for the line.

With a maximum design capacity

Most of the worries are over as Chester Lake, Sharman, Allen, Gay & Taylor superintendent, and Edward J. McNamara, project manager for Freeport Sulphur Company, take a breather during the tensioning of the lines. In spite of the many obstacles which had to be overcome in construction of the line, welding, insulation, and pulling progressed on schedule.

During assembly on the pipeway, eleven completed 2,000-foot strings of pipe are readied for the pull. Seventeen such sections of the triple lines were completed in advance of offshore pulling operations. A high temperature coal tar and fiber glass wrap was applied to all lines exposed to water. In addition the ends of the line received a concrete coating necessary for increasing drag to provide stability and holding the tension until the lines are heated up and reach the compressive stress level.

The offshore terminal of the new sulfur pipe line is at this Grand Isle platform. The riser system brings the lines up from the 50-foot deep water and across to the platform. Two steam turbine driven centrifugal pumping units move the sulfur from the platform. Operations of the line will be controlled from the instrumentation room in the platform offshore.



Schematic drawing shows cutaway view of all five lines in place after construction is completed. The unique pipe line will move 4,500 tons per day of liquid sulfur 7 miles from its offshore mine to Grand Isle.

of 4,500 long tons of sulfur per day or 517 gallons per minute, only about 15 gallons per minute of 325° water would have to be injected into the seaward end of the line to balance the heat loss. At 2,500 tons per day, or 250 gallons per minute of sulfur flow, 25 gallons per minute of water would be needed.

Higher water rates would be necessary for start up and extremely low sulfur rates when hot water delivery might reach as high as 100 gallons per minute. At this higher delivery rate, inlet pressure for the jacket water would be about 1,400 psi. In normal operations, the pumping pressure for the molten sulfur is 1,100 feet of head at the platform.

The second piggy back line, 6⅝-inch diameter will be used to carry a limited supply of fresh water to the mine platform. Fresh water from the Mississippi River will be carried as a ballast in barges from Port Sulphur and then delivered through the line to the offshore camp. Sea water is used in the Frasch mining process offshore.

Pumping equipment. To move the molten sulfur, two steam turbine driven centrifugal pumping units are installed on the platform. Each pump is a 4-inch x 6-inch x 13½-inch two stage process pump with a steam jacketed case, driven at 4,000 rpm to deliver a rated 517 gpm at 320° F. With 1.78 specific gravity liquid sulfur pumps are rated at 1,100 feet of head.

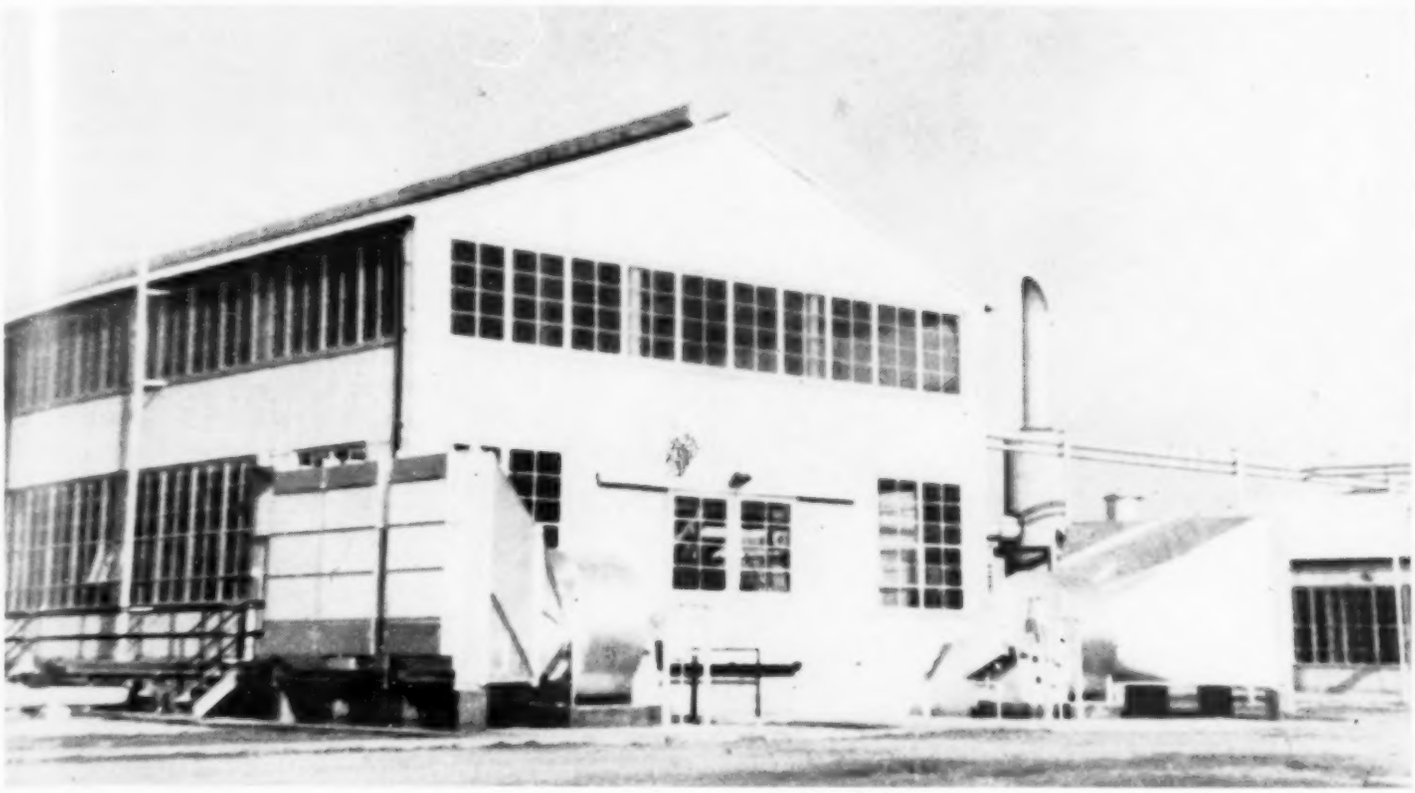
Pumps are designed for continuous heavy duty. Support for the case is at the shaft center line so the entire pumping unit and its component parts are free to expand or contract without disturbing alignment.

Riser facilities. A three pile terminal structure was erected offshore about 40 feet from the power plant platform. From this terminal the various lines rise about 14 feet above the water and 10 feet across to the plant facility. Depth of water at the offshore platform is about 50 feet.

The specially designed "nose cone" was not only used to pull the line and apply tension to all of the pipe lines during construction, but it also will serve as an adapter to attach the sulfur, hot water and casing lines to the risers.

In the event recycling of the jacket water should become necessary, a heat exchanger was built into the riser to allow cooling of the jacket water prior to its entering the 4-inch return line; thus eliminating possible damage to the coating at the platform end.

Control of the pipe line operations will be by instrumentation from the main power plant platform offshore. The line and plant facilities are scheduled to start operation during the first quarter in 1960. —**The Ind**



Michigan Wisconsin installed 45,000 cfm pressurization units at each corner of the building at its Edgar G. Hill station. The air is piped into the basement and hot air is exhausted through a ridge ventilator in the roof.

How to Solve the Dust Storm Problem

Northern Natural and Michigan Wisconsin pressurized compressor buildings; filtered tons of dust out of incoming air every season to solve vexing problem

By Donald M. Taylor
Taylor and Associates, Houston

EVER WEATHERED a dust storm in the nation's so-called "Dust Bowl?" If you have, you'll never forget it! Sometimes it's just short of being buried alive. Dust gets in your mouth, eyes, ears and nose. If you're driving an automobile, you'll notice the radio grounding out every once in awhile. This is caused by high voltage static electricity—not by an actual "ground" caused by so much dust in the air.

If you live in the section of the United States where dust storms may come every season—from January to May—you know there are several kinds of dust storms, some of them downright sneaky. There are those that occur when 70-mile-an-hour winds whip sand, silt, gravel and small rocks from the dry earth. Other dust storms come with relatively little wind velocity—the wind has suspended fine particles from the soil through a disturbance "up stream" so to speak.

Despite the discomfort of the gritty sand, men usually come through a dust storm unscathed—except for their tempers. But what about machines? How do they fare during severe storms?

Just like men, they incur most damage through breathing in the dust. This causes excessive power cylinder wear, oil contamination, ring sticking, etc. But most engines are protected with intake air cleaners, and thanks to continually improved filters, this damage is becoming less every year. However, dust can find other routes into an engine's innards —and "outards," too for that matter.

Problem: dust, dust, dust. Let's take a look at what happens in a compressor building when a balmy spring day suddenly turns into a windy, yellow nightmare of a dust storm. Operators hurriedly close windows, doors and perhaps even the heat valve on top of the building. Despite all precautions, dust pours

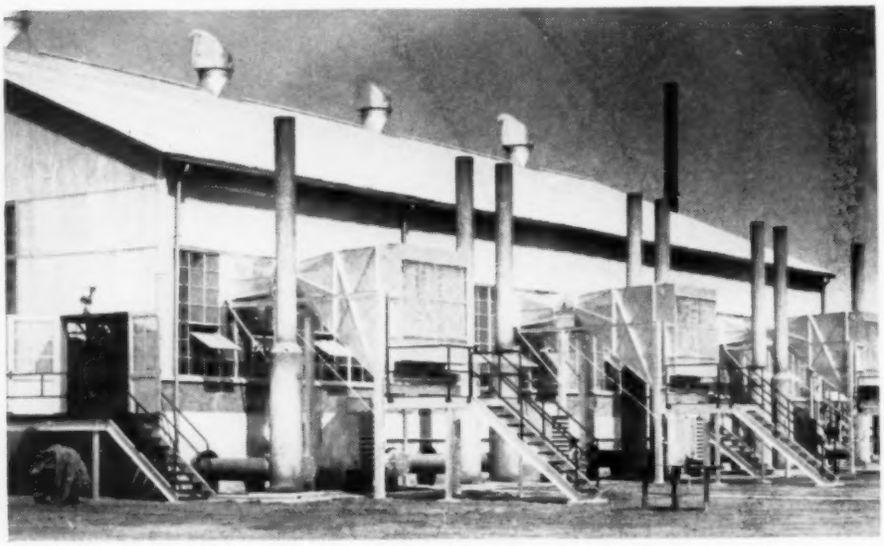
into the building—maybe even tons of it!

Sound unbelievable? Michigan Wisconsin Pipe Line Company reports that workmen removed 16 barrels of sand and dust from the compressor building of the Edgar G. Hill station near Guymon, Okla., following a severe dust storm. This is about four cubic yards!

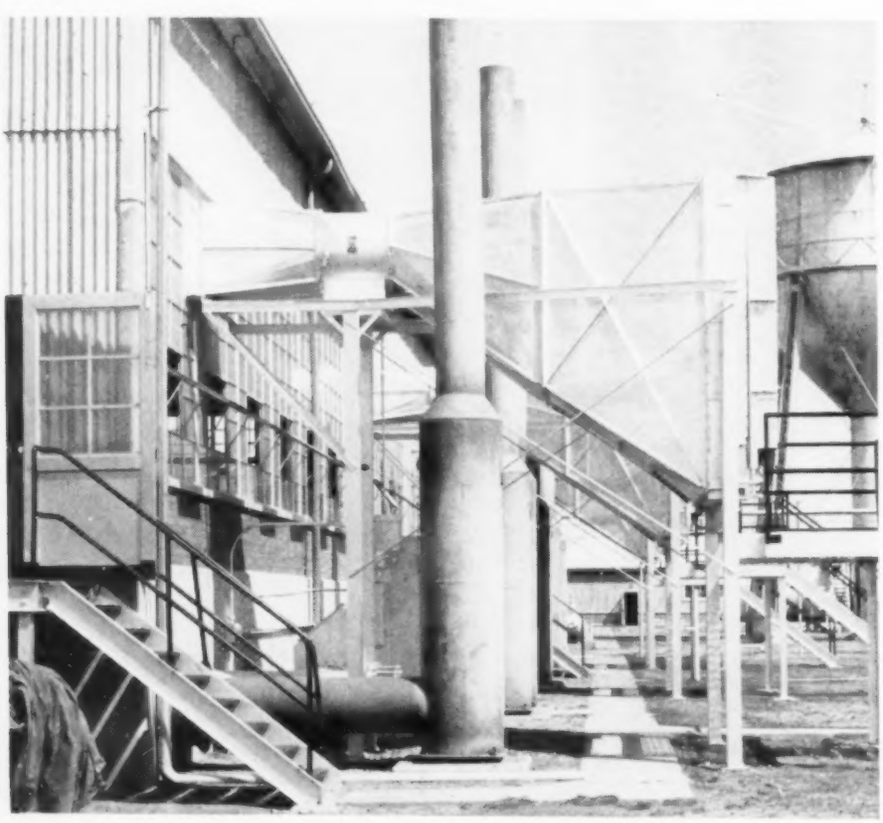
Northern Natural Gas Company reported that following a severe dust storm in 1956 maintenance forces removed three dump truck loads of dust—(each load being about five cubic yards!)—from the Hugoton Station.

In the past operators partially minimized dust damage by putting dust covers over exposed engine parts, and starting clean-up immediately after the dust storm. However, dust would continue to plague operators and present a housekeeping problem for months to come as it sifted down off the supporting beams in the roof of the compressor building.

Should the dust storm come during a repair job, it usually means longer down time; all parts must be cleaned of dust before reassembly. The same goes for overhaul. Too, there's the problem of oil contamination. Engines breathe. During a dust storm they breathe dust-laden air. Result: dust in the crankcase.



Northern Natural installed three filter units on the east side of its Liberal, Kansas station. Roof ventilators are shown on top of the building as well as one of the 8 by 8 doors located at each corner of the building.



The 25,000 cfm filters were located high to avoid the dust loading picked up from the ground near the building. The piping and location of overflow and drain lines to each filter section at the Liberal station are visible.

Northern Natural takes the lead. In early experimental work on this problem, Northern Natural tried air washers and large centrifugal fans at the Liberal, Kans., station, but still, particles of silt came sifting into the building. Obviously, the first step in solving the problem was to provide some semblance of an air-tight building. This meant that all cracks in the building had to be caulked with a material that would withstand the extreme temperature variations, dry air and wind velocities common to southwest Kansas. Through trial and error, Northern engineers found a highly effective caulking compound carrying a 10-year guarantee.

The second step was to design an air supply system which would maintain a positive pressure within the building of 0.90 inches of water despite the leakage that was encountered around the doors and windows.

The third phase of the solution was to find a filter which would handle a high volume of dust-laden air without great maintenance.

Northern's solution. Northern's Liberal station is a small one. It has four 26 x 36 twin tandem horizontal engines of 1,600 hp each. Typical of stations built in 1950, the building has asbestos sheet sides, a large expanse of glass and windows, gravity roof ventilators and large access doors at each corner and in the middle of each side. Once the sealing compound had been selected, the caulking was contracted, and weather stripping was added to doors and other openings.

The calculated volume of the building was 236,000 cubic feet. Engineers estimated that if an air supply system could supply an air change every three minutes—or about 75,000 cfm—it would maintain a positive pressure of 0.90 inches of water inside the building with no-

mal leakage that could be expected around doors and windows.

Northern elected to use three filter-fan units, each with a capacity of about 25,000 cfm. They were mounted some distance above the ground to eliminate dust and sand picked up by high velocity wind gusts near the building. They were installed on the east side of the building—the side least likely to receive the direct assault of the spring winds.

The filters are self cleaning. They have vertical weather louvers, and trash screens to keep tumble weeds out of the louvers. The reservoir has sufficient capacity to take care of the dust encountered in a normal dust storm. However if the storm is severe, sludge may have to be removed every three hours or so. Quick access to the filter curtains also was provided so ice could be cracked off in cold weather.

The blower installed at Liberal was an axial vane fan driven by a 15-hp electric motor. Turning at 1,750 rpm, the fan makes considerable noise—however, this disadvantage seemed pale in comparison with the dust invasion.

Effectiveness of Northern's system. Shortly after the "dust-proofing" job had been completed at Northern's Liberal station, a severe dust storm occurred. Despite 70-mile winds no appreciable dust entered the building. Engines were operated without dust covers, even though two windows were opened in the basement to carry off building heat. After 8 hours there was 2½ inches of mud in the sludge tank of the filter.

Another measure of effectiveness is apparent in the results of tests run on the system:[1]

Position of Vents	Pressure Drop Inches Water 3 blowers operating	Pressure Drop Inches Water 2 blowers operating
Vent closed	0.93	0.62
Vent open	0.64	0.55
Vents open	0.51	0.40
Vents open	0.37	0.20
Vents open	0.35	0.20
Vent closed—4' x 8' door open	0.36	0.20

Static pressure on fans with three fans operating:

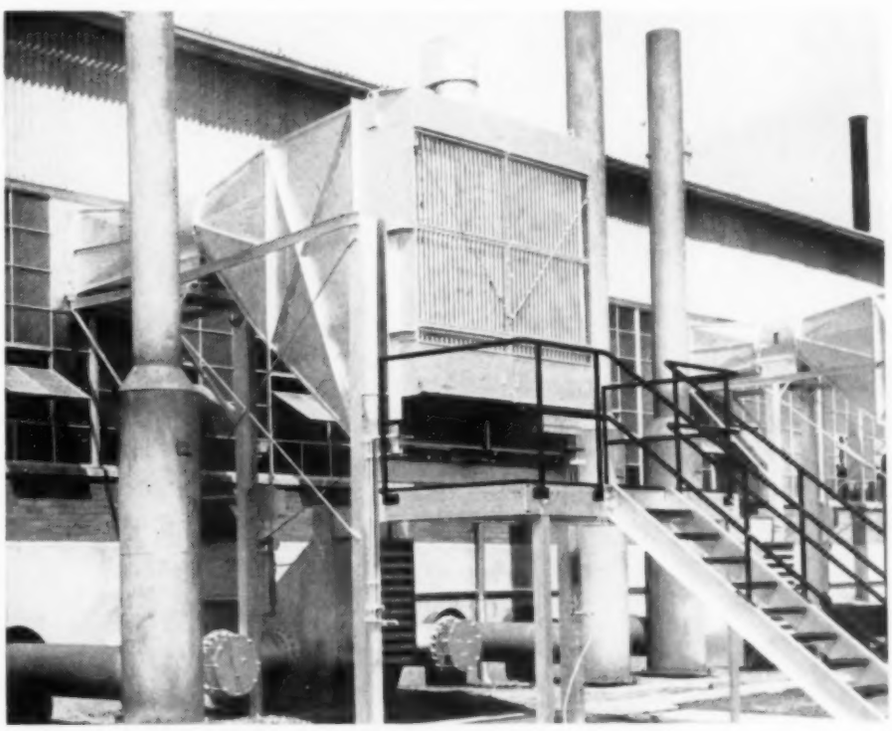
Vent Position	Static Pressure Inches Water	Indicated Air Volume Per Filter
Vents closed	1.60	25,500 Cfm
Vents open	1.25	26,700 Cfm
Vents closed—4' x 8' door open	——	28,200 Cfm

Cost.[1] Here's a summary of cost of pressurizing the Liberal Station:

Caulking the building	$4,200.00
Fans	3,000.00
Filters	8,000.00
Steel and erection	6,000.00
Electrical work	800.00
Total Cost	$22,000.00

On the basis of a building volume of 236,000 cubic feet, the cost was 9.3¢ per cubic foot. A more realistic figure would probably run from 10 to 12¢ today.

At the Liberal station, air is admitted to the building directly under the crane rail. A deflector will be placed on the bottom of this outlet and hinged at the bottom. This is closed when fan is not in operation, preventing back draft.



Liberal station filters are self cleaning, with vertical weather louvers and trash screens to keep weeds out of louvers. Quick access to filter curtains was provided so ice could be cracked in cold weather.

NOTES ON DESIGN

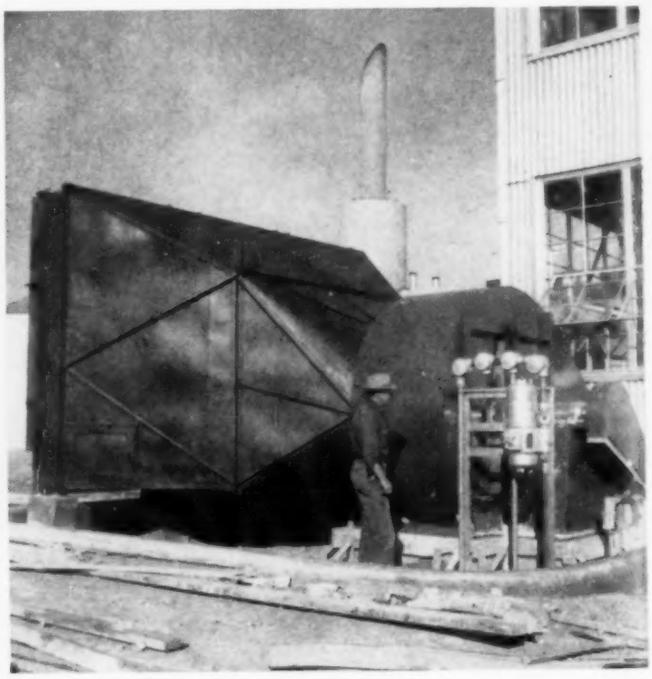
Outside structure is designed to withstand winds up to 115 miles per hour.

Path of air through the building. Air is admitted into the building directly under the crane rail. There is a deflector at the bottom of the outlet. It is hinged so it can be closed when the fan is not in operation. At the Liberal station two basement windows are kept open, so the air will flow downward over the engines and exhaust through them. Under these conditions, static pressure in the build-

To make doors easily operable in the pressurized stations, Michigan Wisconsin used an air cylinder, diaphragm valve and a pilot valve for pneumatic control. With the pilot valve mounted on the door and connected to the door latch, a light pressure applied to the safety latch actuates it.

Workman seals opening where exhaust pipe protrudes through Edgar G. Hill compressor building. Light, medium, and heavy grades of sealing compound were applied on the inside seams of the building's paneled lap joints. Weather stripping was used on doors and windows.

Michigan Wisconsin placed warning lights both inside and outside the building at each door opening and they automatically illuminated when the pressurization system was in operation. Caution light, above, is mounted outside basement door.



Michigan Wisconsin's Dale Shea, assistant station superintendent, inspects blower motor starter on one of the pressurization units. The 18 by 24 inches airtight trap door, extreme left, gives access to rear of filter and fan.

ing is about 0.8 inches of water; at the fan it is 1½ inches.

Air volume. Air is changed every three minutes.

Filter size. Filters are sized to give 400 feet per minute face velocity.

Effect on building. Most modern buildings are designed for 100 mph winds. This is equivalent to 5¼ inches of water static pressure. On the windward side of the building, the pressurization helps overcome the effects of the wind forces. On the lee side it is doubtful that the effects of the wind and the additive pressurization will ever equal the design figure.

Northern's present practice. Since the original installation at Liberal, Northern has pressurized all of its

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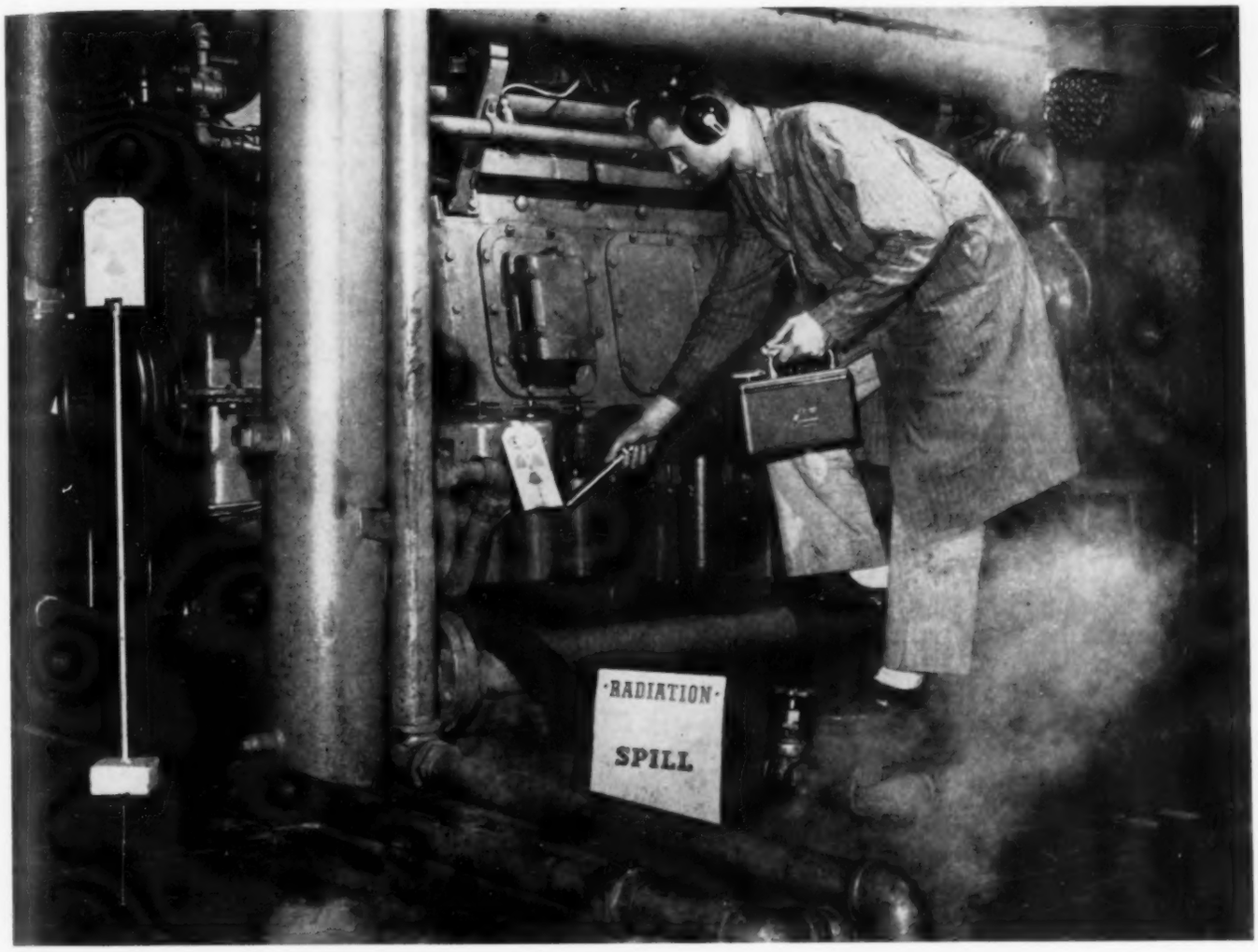


Radioactive isotopes at work—studying what goes on inside a large engine. Lube oil consumption shows up instantly because if it is burned inside the cylinder, radioactive particles show up in engine exhaust.

What Happens to Engines in the First 100 Hours?

Think you know engines? See if your answers agree with these research findings with radioactive tracers

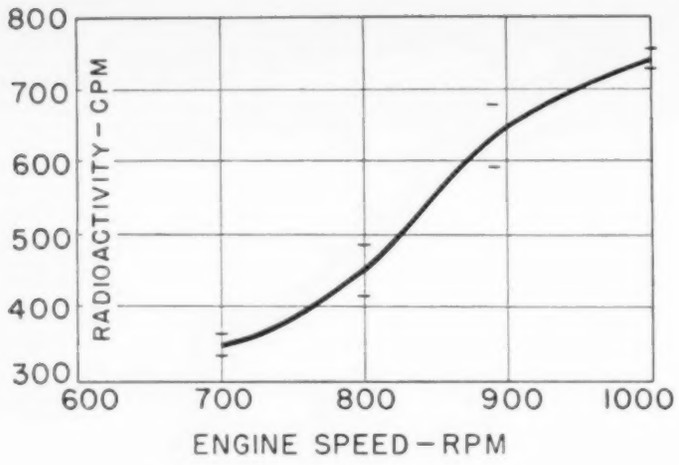
By **E. J. Fithian,** Development Engineer
The Cooper-Bessemer Corporation, Mt. Vernon, Ohio

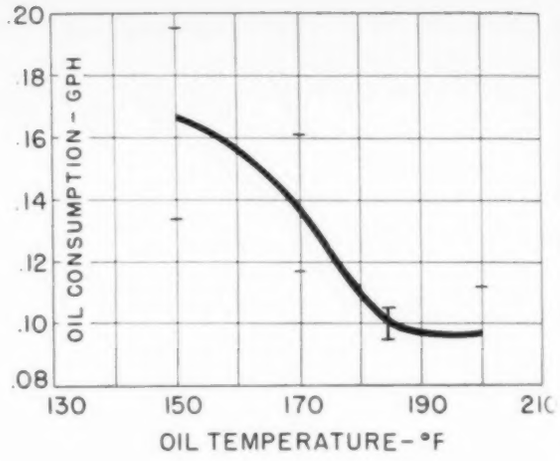
WHAT HAPPENS INSIDE a new diesel engine during the first 100-hour break-in period? Is there high piston ring wear? Does speed affect oil consumption? Does temperature increase or decrease oil consumption?

These questions concern every engine man and every company interested in top engine performance, life and economy. Engine manufacturers are interested in the answers, too. Their prime concern is to find ways to reduce lube oil consumption, increase piston ring and cylinder liner life, etc.

New Techniques in using radioactive isotopes for studying engine wear are proving quite effective in showing what goes on inside a modern, high-output diesel engine. Moreover, it shows wear the moment it happens.

To better understand the advantages of the new technique, take a look at the results of a standard 100-





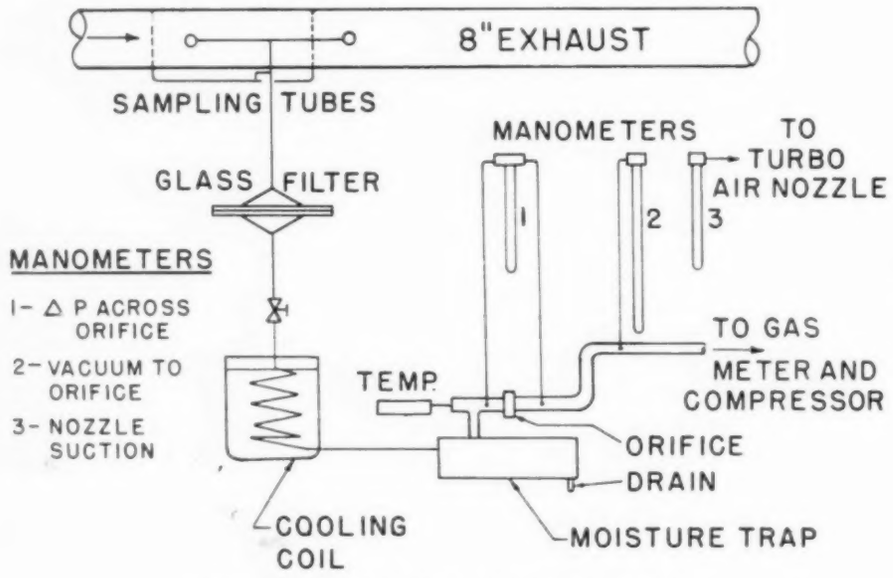
Oil consumption as a function of engine speed (top left).

Oil consumption as a function of oil temperature (above).

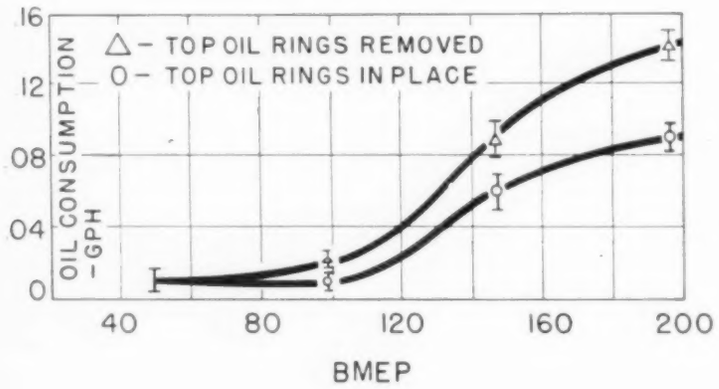
How the radioactive particles in the exhaust are detected (left). One of the important findings of this test is that lube oil consumption does not change a great deal in the first 100 hours, and that an increase in jacket water temperature, lube oil temperature reduces oil consumption.

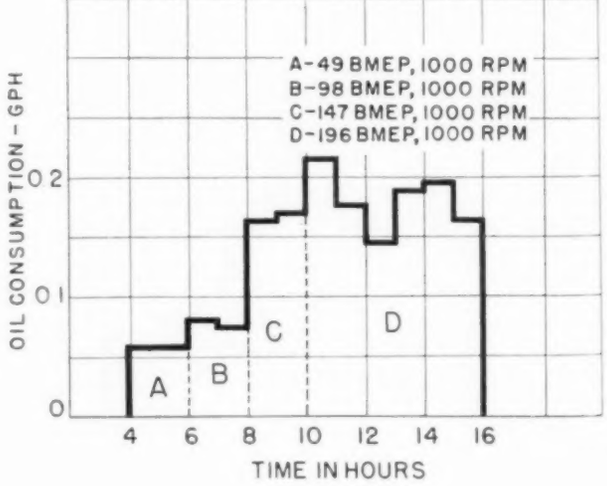
Oil consumption as a function of engine load (lower left).

Oil consumption during break-in (below).



EXHAUST SAMPLING SYSTEM





hour oil consumption and ring wear test. Under previous test methods, oil consumption normally could be determined only by measuring the amount of lubricant added to bring a crankcase level to its initial height. Because oil consumption in any one short period could not be detected, it was difficult in the past to determine, during a 100-hour run for example, just when excessive oil consumption was occurring. The same held true for piston ring wear or other wear variables occurring during some part of the test run period.

To find answers that would effectively help evaluate engine wear and oil consumption, particularly during the break-in period, our research engineers in conjunction with Battelle Memorial Institute have developed a radioactive tracer method of engine research. The method has proved to provide the necessary sensitivity in

that it successfully measures the rate of oil consumption as a function of time and engine operating conditions.

What the Research Shows: Briefly, the results of the initial tests show that:

- **The rate of lube oil consumption does not change during the first 100-hour run-in period.**
- **If early high piston ring wear does exist, it has no apparent relation to oil consumption.**
- **As engine speed and load increase, oil consumption increases.**
- **Increasing of oil temperature and water jacket temperature decreases oil consumption.**
- **The top oil ring on a piston has a marked effect on maintaining low lube oil consumption.**

How it Was Done: The use of the radioisotope tracers for engine studies is based on the fact that a radioactive tracer is carried into the exhaust stream from lube oil burned in the cylinder. As a result, simply sampling the exhaust stream indicates instantly what is occurring within the engine. Diagrams show the engine test procedure used at our Research Department for this initial work. Shown in the charts is detailed test data showing the effect of engine variables on lube oil consumption.

About the Author

E. J. Fithian, Jr. has been active in the development of large industrial engines for over 10 years. He was graduated from Purdue University with a bachelor of science in mechanical engineering.

Since joining Cooper-Bessemer Corp. in 1949, he has been a project engineer in engine development; he presently is supervisor, railway engineering.

How to Solve the Dust Storm Problem

Continued from Page 52

compressor stations in the "Dust Bowl." Basically, the design is the same. However, equipment has varied slightly. Air filters with 45,000 cfm capacity are used. The number of air changes are the same: a change every three minutes. Fans are direct connected axial vane blowers operating at 1,150 rpm, capable of delivering 40,000 cfm at 1½ inches of static pressure.

Michigan Wisconsin's Edgar G. Hill station. At this station right in the heart of the "Dust Bowl," Michigan Wisconsin tackled the pressurization problem using principles already proven. At the same time, company engineers added improvements of their own—pneumatic controls for vents and doors, warning lights for operators and a different direction of air flow through the building.

This is the largest compressor station on the system; the building measures 415 feet long, 44 feet wide and 32½ feet high. Its volume exceeds ½ million cubic feet. Michigan Wisconsin engineers designed their pressurization system to operate on a basis of an air change every three minutes as did Northern Natural.

Caulking and sealing. Light, medium and heavy grades of sealing compound were applied on the inside seams of the Edgar G. Hill station's paneled lap-joints. Weatherstripping was used as needed on all doors and windows.

Pressurization units. Michigan Wisconsin elected to install four units having a capacity of 45,000 cfm—each. The filter, blower assemblies were installed at each corner of the building, and air was piped into the basement. In this instance, the flow is up over the engines with the hot air exhausting through a ridge ventilator in the roof.

Pneumatic controls. Pneumatic controls were installed on doors—opening and closing a door while the building is pressurized can be difficult and cumbersome. Using an air cylinder, a diaphragm valve and a pilot valve, engineers made the doors easily operable. With the pilot valve mounted on the door and connected to the door latch, a light pressure applied to the safety door latch actuates it. The pilot valve in turn controls the diaphragm valve which regulates the flow of air to and from the operating cylinder.

Ridge vents. A unique feature of Michigan Wisconsin's plan was to install pneumatic cylinders to control the use of the ridge ventilator which runs the full length of the building in the peak of the roof. The cylinders were necessary to provide the required power to open the ventilator when it was needed. The power also holds the ventilator closed, resisting the pressure inside the building when the blowers are operating.

Signals. Warning lights were placed both inside and outside the building at each door opening and they automatically illuminated when the pressurization system was in operation. They served as efficient mechanical reminders to station personnel that a whoosh of air would follow the opening or closing of a door.

Electrical work for the system included a new distribution panel on the switchboard in the auxiliary building, power circuits to the blower motors, air filter screen motors, and "warning lights."

Advantages of pressurization. The advantages of controlling dust can't be overemphasized—ask any operator in the Dust Bowl. Aside from reducing the short tempers, the difficult breathing, static electricity in the clothing of operators, the elimination of dust from the compressor building can mean less engine wear, less oil consumption and speedier repairs and overhaul.

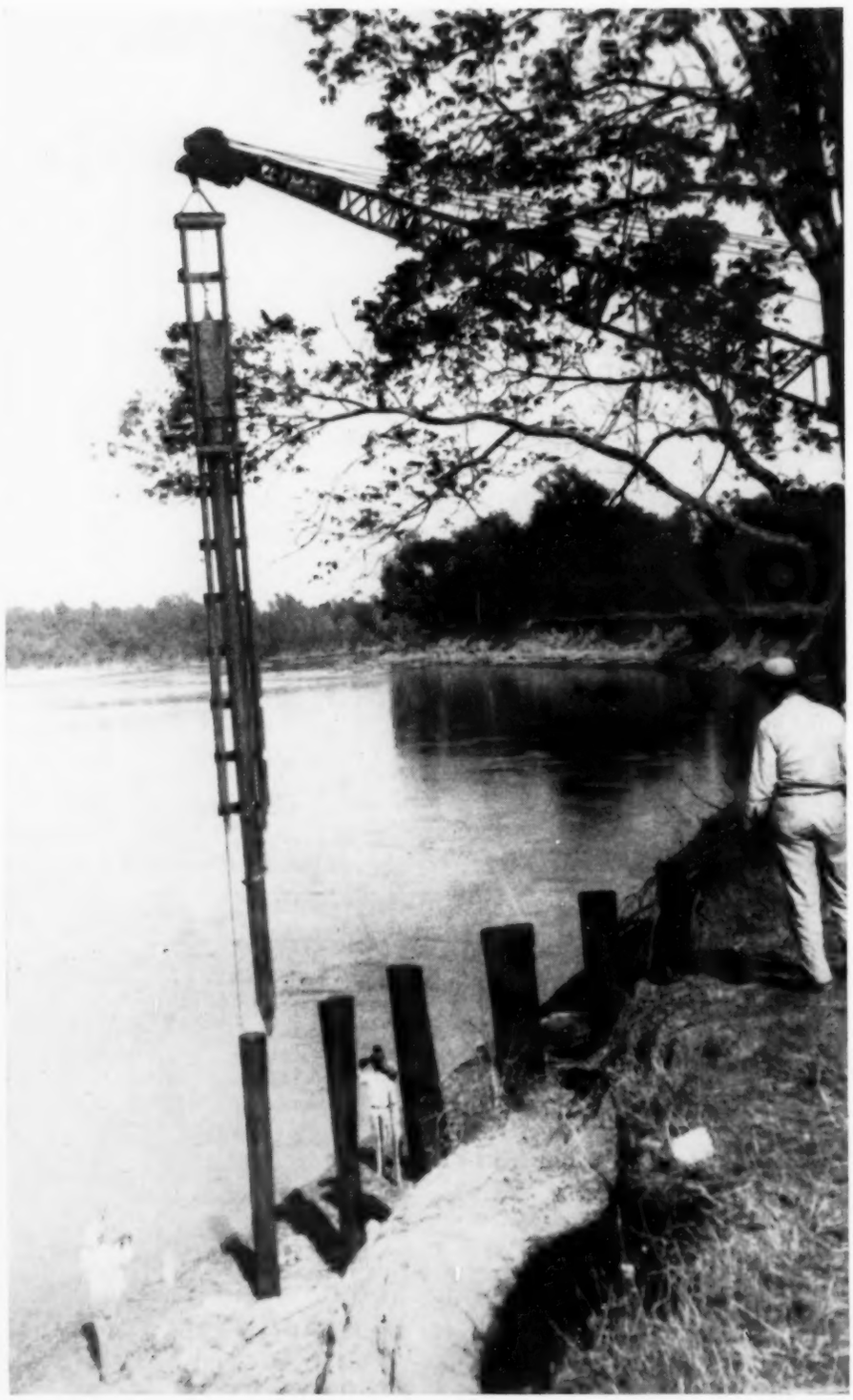
REFERENCES

[1] "Pressurization of Northern Natural Gas Company Liberal, Kan. Compressor Station" by The Rush Company, Kansas City, Mo.

[2] May 1958 issue of Michigan Wisconsin's company publication, *The Mainliner*.

[3] Correspondence with Dwight M. McMakin, American Air Filter Co., Inc.

Holding Back a River



Pile-driving hammer attached to an extended boom on a dragline. This hammer which was shop fabricated by Texas Illinois maintenance crews proved quite effective in driving the 25 to 30 feet of piling some 10 feet into the river-bed soil. Shown here is a view of the south bank of Arkansas' White River.

Pile-driving pipeliners divert the White River with a shop-made pile driver and a unique idea

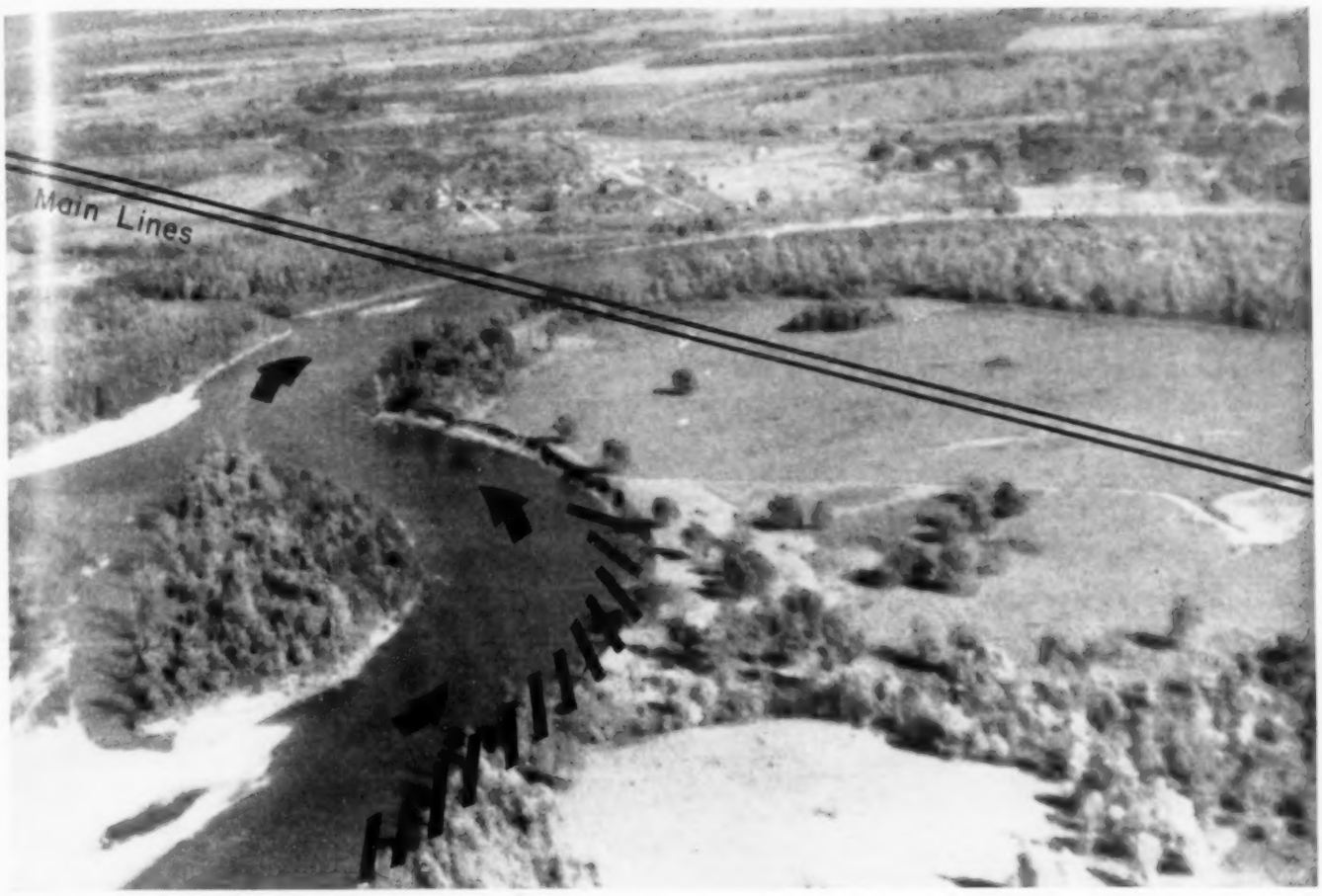
THE CROSSING is in Arkansas—just a few hundred yards below where the White River and the Black River come together!

This confluence of waters apparently is not a happy one. The charging White River (as the combined streams are named) apparently has made up its mind to change its course. It chewed away nearly 60 feet of riverbank just upstream from Texas Illinois Natural Gas Pipeline Company's mainline crossing. At other nearby points it gobbled up anywhere from 10 to 50 feet of soil; and left to its own devices, the river would completely uncover the twin crossings in less than 10 years. Obviously, this called for the classic "step in time!"

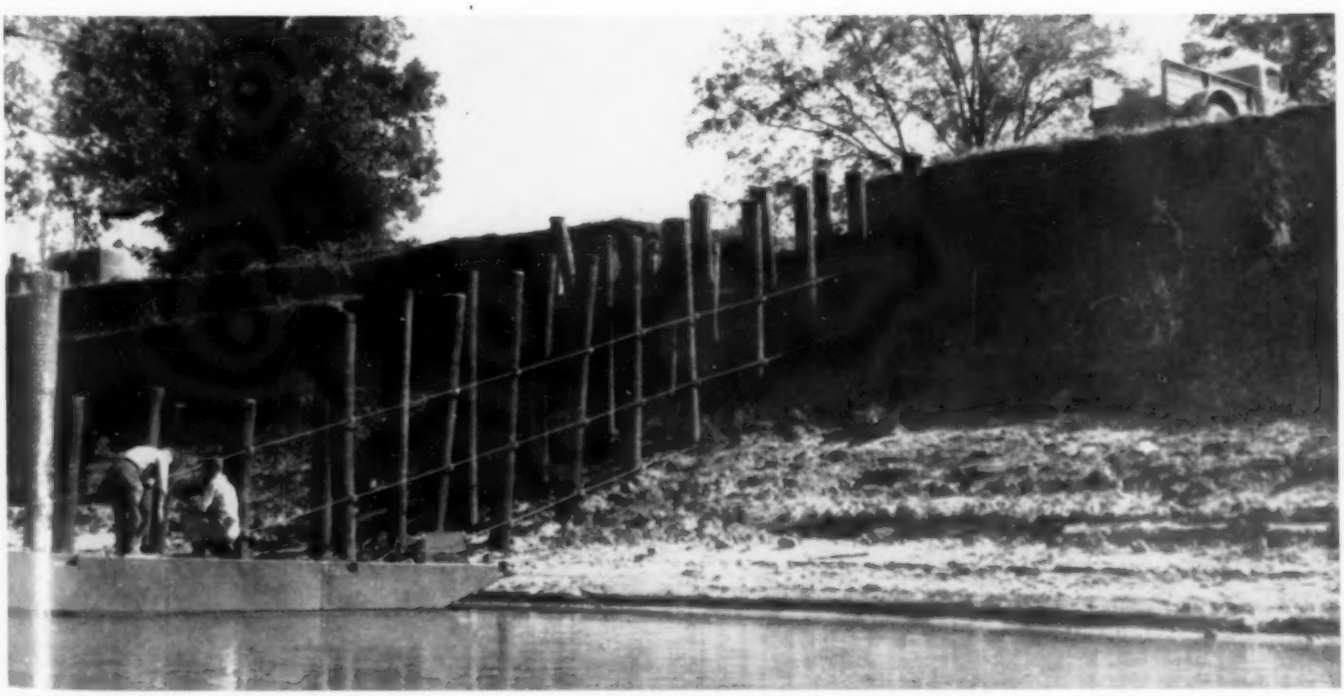
Lowering the crossing would have cost about $250,000, and this is enough money to create a furrow on most any pipeliner's brow. In this instance, the thinking paid off for Texas Illinois. It saved the company about $175,000!

The pipeliners' idea has been classed as unique, unusual and downright ingenious by men who know river control problems. In fact, the U.S. Corps of Engineers not only approved of this method, it sent representatives to the job to observe construction.

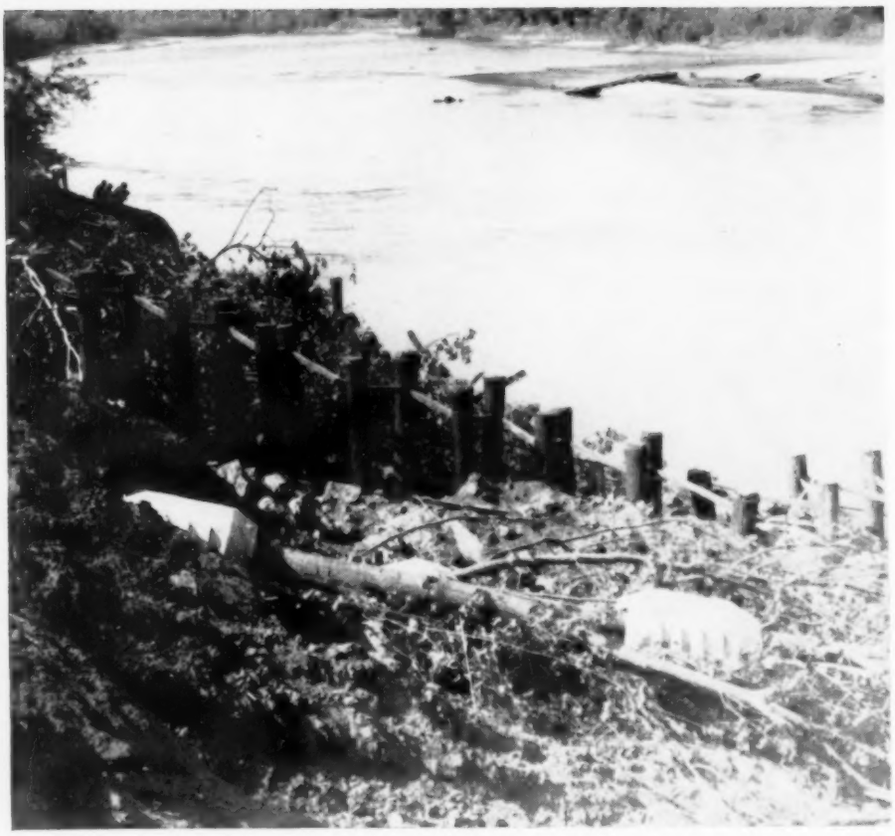
Piling Deflectors. In a nutshell, here's the way the idea works. Twelve deflectors were installed along the river bank. These deflectors—which are actually jetties made of piling, rock and trees, etc.—turn the current or still it before it impinges on the bank that lies solidly athwart its path. In between the jetties, trees were



Aerial view and map showing the confluence of the White (right) and Black Rivers in northeast Arkansas. Note the dashes, lower center, which indicate the 12 jetties designed to slow or deflect the current which had been impinging on the bank below the twin crossing. Original jetties were constructed last year; 12 more will be constructed this fall. The Black River comes from the left; the White River from the lower portion of the photo. The two crossings are around the bend. Had the assault on the bank gone unchecked, the river would have uncovered the lines in 10 years.



Texas Illinois pipeliners attach wire rope to pilings which form the jetty. Each jetty was made up of 26 pilings.



Felled trees were bedded into the bank between jetties and weighted down with concrete blocks and steel jacks as a further curb to erosion.

Stones weighing up to 500 pounds were hauled from a quarry to protect the base of the pilings from current scour. They also contributed to stilling and turning the current.

bedded into the bank and weighted down with concrete weights to further protect the bank from scour.

The jetties were installed at 75-foot intervals. Each angled from the direction of the current in a manner designed to turn the walloping stream as shown in the accompanying drawing.

Each jetty was made of 26 individual 8-inch creosote-treated wood pilings. These pilings which were 25 to 30 feet long were driven about 10 feet into the sand and clay bottom of the White River. The work was done when the river was unusually low, enabling pipeliners to move equipment onto what normally is the river bed. Otherwise it would have been a marine job.

Maintenance Crews Become River Experts. Texas Illinois maintenance crews from Biggers, Ark., and Poplar Bluff, Mo., did the entire job, using a limited amount of temporary outside labor. They worked seven days a week, 10 hours a day to complete the installation before the fall rains sent the waters to bankfull level.

One of the innovations attributed to the pipeliners was the shop made pile driver. As shown in one of the accompanying photographs, it did not differ greatly from manufactured ones.

Rock Fill. Once the jetties were completed, pipeliners hauled quarry rock weighing up to 500 pounds to the site. They placed this around the base of the piling to impede scouring and to aid in turning and stilling the current. At critical points between the jetties, they trimmed trees and brush, bedded them into the bank and river bed and weighted them down with ordinary concrete weights and steel jacks.

Immediately after the job was completed, rains sent the river nearly to bank level. Observers found that the jetties were even more effective in stilling the current than was expected. The total cost of the job was about $75,000 some $175,000 less than the cost of lowering the two pipe lines below the scour line. The Texas Illinois pipeliners are proud of the money they saved the company. Too, they are proud of their safety record on this job—which was spotless!

It's always exciting to observe ingenuity at work. —The End

How to Get the Most Out Of Electrical Controls

Here is a sound schedule for maintaining electrical controls and a trouble shooting chart to follow

By H. A. Wright
Supervisory Engineer
Allis-Chalmers Mfg. Co., Milwaukee

MOST ELECTRICAL CONTROL devices will give trouble-free service if they are properly applied, have adequate electrical system and are correctly maintained. But because of their great dependability, they are easily overlooked in the maintenance program. If trouble comes, it's likely to lead to a whole chain of troubles unless remedial measures are swift and early. Here are some maintenance measures which will pay big dividends in operation:

Only skilled personnel familiar with electrical equipment and the hazards involved, should be permitted to service control units. They should follow a periodic inspection schedule and precautionary maintenance program similar to this one. Object: Savings in replacement parts and downtime of machines.

Starting with the most obvious—dust, dirt and grease should be removed periodically from the controllers. Dust can cause mechanical failures and short circuits. Dry dust can be blown off; sticky dust and grease are best removed with commercial solvent. Care should be taken when using solvents so the coils do not become soaked. Special attention also must be paid to rust and corrosion, particularly on thermal overload relays.

EXAMPLE: *Dust Trouble.* Trouble was reported in a plant which used considerable lamp black in its process. Difficulties centered around size No. 1 starter having compensated thermal overload relays which apparently were failing to drop out under overload. Investigation showed the relays were opening under overload but not opening the coil circuit. So much carbon dust had collected on the overload relay contacts that the coil circuit was maintained through the carbon dust. Therefore, the starter magnet held in even though the overload relays had operated. In this instance, the starter should have been in a dust-tight enclosure, or a frequent cleaning schedule maintained to blow the carbon dust out of the starter.

EXAMPLE: *Corrosion Trouble.* Another plant had a very severe corrosion problem. All operating parts on the starters were carefully maintained, but the overload relays which do not operate under normal conditions were so thoroughly corroded that when an overload was experienced, they would not trip. Actually, the overload relays had grown together so there were no longer any moving parts.

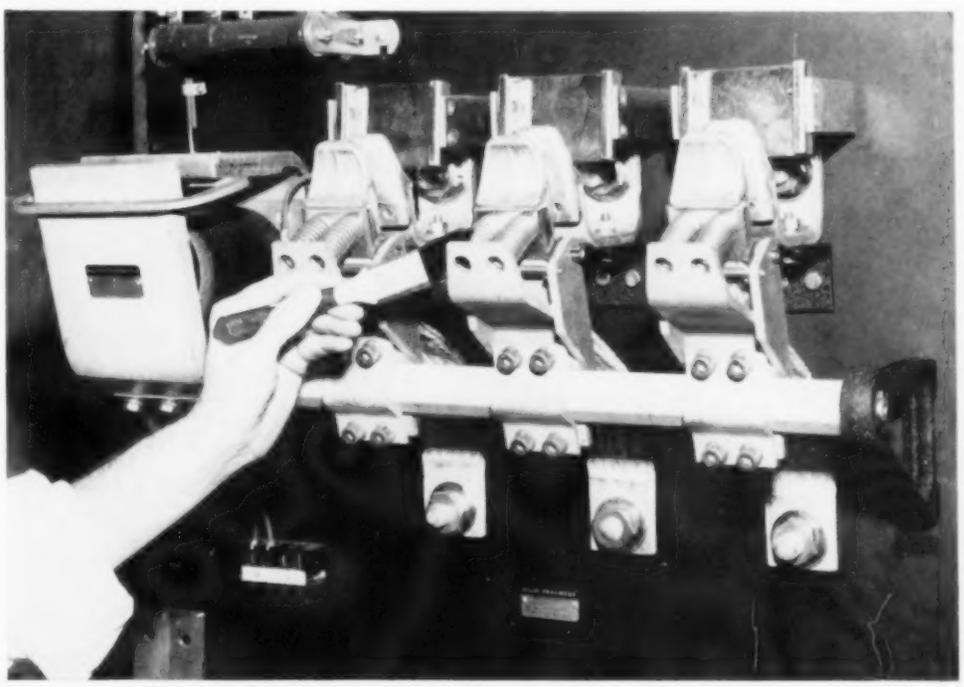
Mechanical parts that move should be free from excess friction. The parts should be tried by hand to locate any loose pins, bolts, etc. Wearing parts should also be checked for excessive wear. The bearings on electrical control equipment are designed to operate without lubrication. If oiled or greased, dirt will accumulate and cause sluggish action and possible failure.

Overheated parts are always a sign of trouble. Because various parts operate at different temperatures, it may be difficult to locate this trouble. For example, coils, blow-out coils and other parts of the contactor may operate at a temperature which would boil water, hence these parts cannot be touched. Any evidence of baking or smoking, however, should be cause for immediate attention.

Loose connections, always a source of trouble, may develop at any time. Therefore, control connections should be checked periodically along with the main line connections.

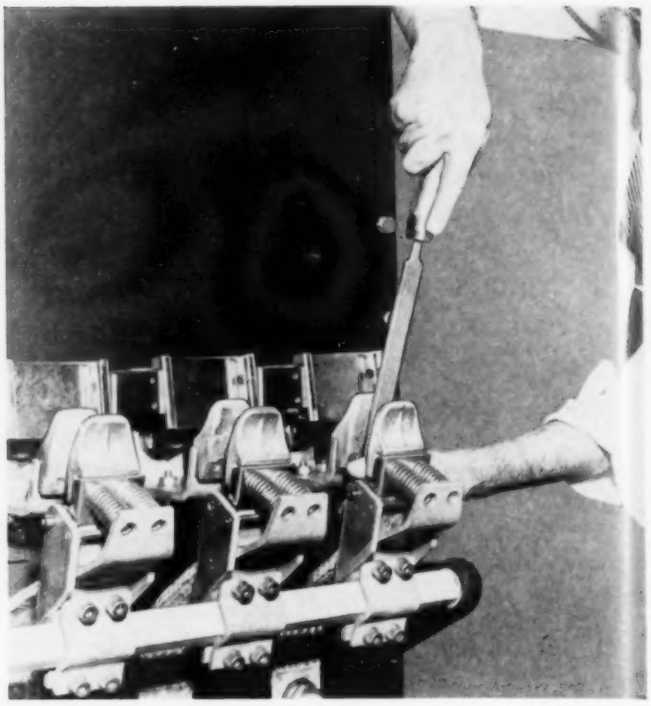
The best way to check for grounds which may develop is to megger the cables and conduits periodically. This is especially necessary if water could collect in the conduit.

Contactors need the most care. Their bearings should be checked for free operation but not lubricated. Deposits on contacts should be removed

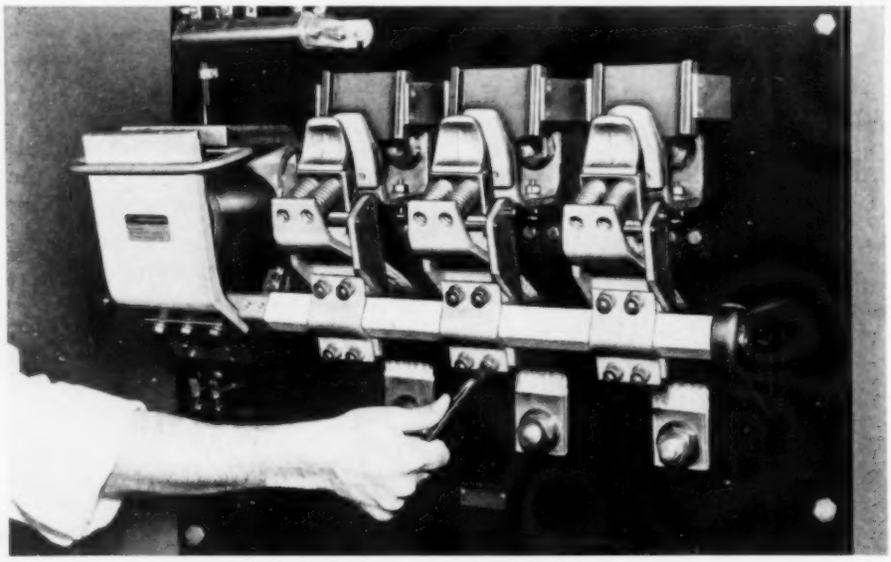


Dirt, dust and grease must be removed periodically from controllers. Dry dust may be blown off or brushed as shown.

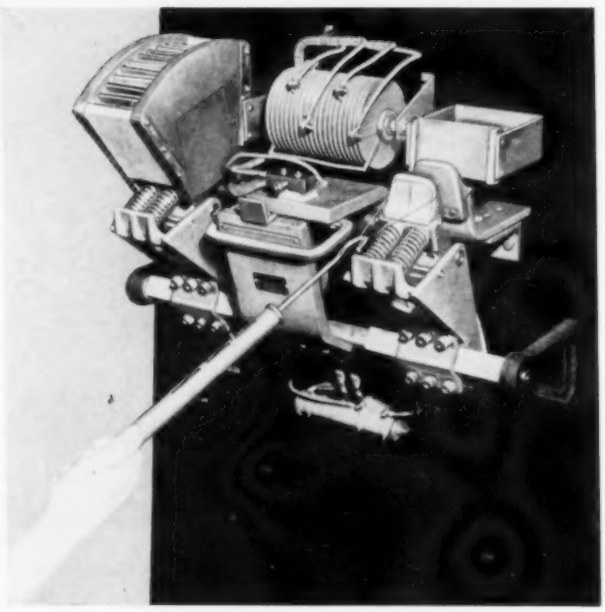
When cleaning the magnet assembly with a solvent, don't let the coils become soaked.



Although pitting of contacts does not affect their operation, deposits must be removed (right). When dressing contact tips, the original shape must be retained.



Check clamp on operating shaft to permit adjustment for contact over travel, proper alignment, pressure and to compensate for contact wear.

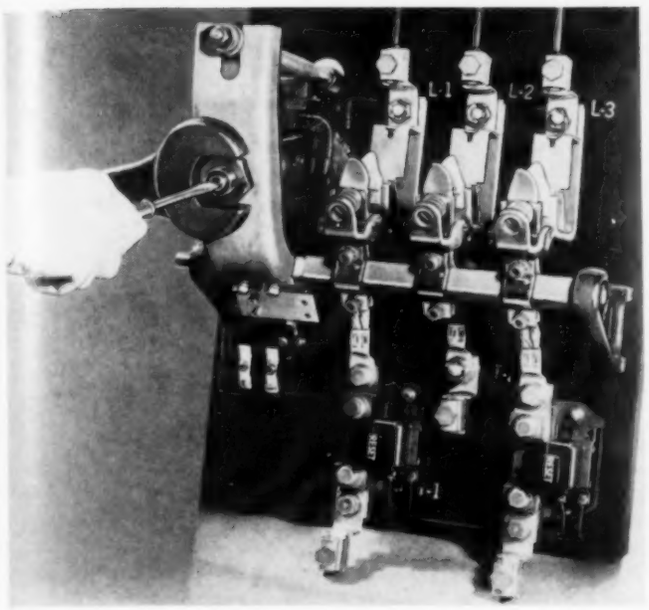


Initial spring tension should be checked with a scale in accordance with the manufacturer's recommendation. Final contact pressure should be checked at the contact heel in a similar manner except that the magnet is in closed position.

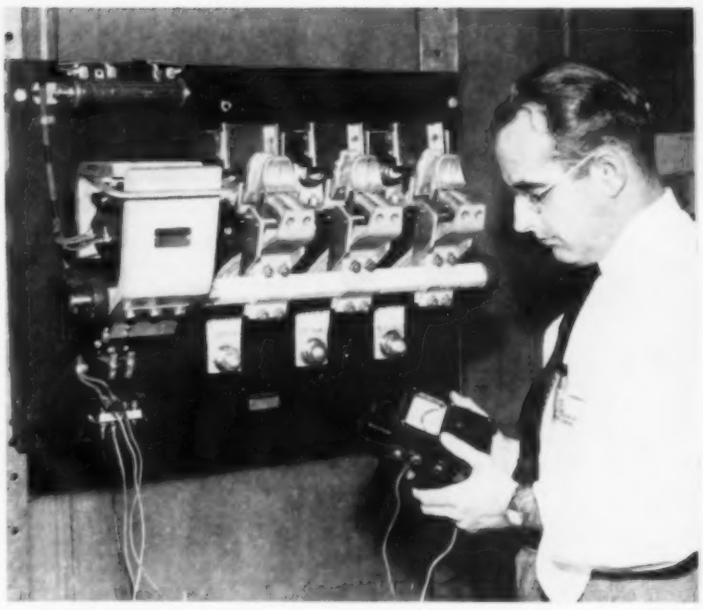
with either sand paper or a fine file. Never use emery paper for it imbeds in the contact face and continues to wear the contacts. In filing, care should be taken to maintain the original shape of the contact. However, remove all copper oxide that has formed on contact tips because it can cause failure.

EXAMPLE: *Contactor Trouble.* A synchronous motor-starter on a pump operated continuously without a shut down for long periods of time. After about three months operation the motor would lose its field for no apparent reason. Upon investigation it was found that sufficient copper oxide was forming on the field contactor tips to insulate them. This was difficult to explain because the contactor was rated at 50 amps and the field current was only 16 amps. But the contactor remained closed for long periods of time, and there was no cleaning action to knock off the copper oxide during this period. Maintenance was impossible between turn-arounds. As a result, the small amount of copper oxide which formed caused more heating, more copper oxide, etc., until failure occurred. By replacing the copper contact tips with silver tips, the difficulty was solved.

Silver contacts should never be filed unless they become severely roughened. Silver oxide is a good conductor and does not need to be removed. When contacts are deeply pitted, burned, or worn thin, they should be replaced in sets with new ones. Screws



To insure perfect sealing and alignment of armature with the magnet, adjust the screw as shown. Be sure the armature closes simultaneously on top and bottom legs of "E" frame.



Proper installation and maintenance of control is vital to its ability to perform satisfactorily. Checking the line voltage is a wise precaution. Low voltage is apt to show up especially during starting.

Thermal overload relays should be reset and maintained by an experienced man.

If water, sludge or excess carbon is present in high-voltage, oil-immersed contactors, new oil should be used. Check contact tips when inspecting oil for presence of carbon, etc.

holding the contacts in place should be kept tight at all times.

Springs are important. They maintain the proper contact pressure. If contacts are permitted to wear too thin, spring pressure decreases and over-heating results. This generally causes the spring to lose its temper, further decreasing the contact pressure. Spring tension should be checked with a scale in accordance with the manufacturer's recommendation. If a scale is not available, a comparison test could be made between the installed spring and a new one of the same design. Where neither of these tests are possible, springs may be checked by compressing with the fingers to determine whether one is weaker than the others. A good rule to follow is to replace contact springs when replacing contacts.

New methods of impregnation have greatly reduced coil burnouts. However, in the event of AC coil failure, the contactor should be checked for mechanical binding or blocking. For example, an AC contactor coil may have a 47-ampere inrush value with the magnet open and 1.7 amperes with the magnet closed in the sealed position. If the magnet is accidentally blocked open, or the voltage is so low that the magnet cannot seal against the contact springs, the current will be high, causing a burn-out.

Connectors made of fine, stranded wire are subject to repeated flexing. Eventually some of the strands may

PREVENTIVE MAINTENANCE CHECK LIST

Date ..... Tool No. ..... Voltage .....

Serial No. ..... H p ..... Location .....

Pull disconnect switch before working on control

Check	Item	Operation
☐	**Dust**	Clean.
☐	**Rust and Corrosion** . .	Clean—Report if excessive.
☐	**Connections**	Tighten electrical connections, look for discoloration of any copper current carrying parts.
☐	**Nuts and Bolts**	Check mechanical connections.
☐	**Fuse clips**	Check for spring clip pressure.
☐	**Fuse ferrules**	If copper, polish; loose ferrules and proper size fuses.
☐	**Contact tips**	Look for copper oxide scale, dress only if necessary. Check roll and wipe.
☐	**Contact pressure** . . .	Check contact pressure, is pressure same on all tips.
☐	**Flexible leads**	Look for frayed and broken strands, flexing over entire length.
☐	**Bearings**	Do not oil; are they free moving.
☐	**Coils**	Check for any signs of overheating or mechanical injury.
☐	**Magnets**	Clean faces, check shading coil, misalignment, mechanical binding, striking coil.
☐	**Overload relays** . . .	Trip by hand, mechanically free, clean, check heater coil and tighten all connections.
☐	**Arc shields**	Check for breaks and burning.
☐	**Blowout coils**	Check for overheating and tighten.
☐	**Dash pots**	Free; clean, if oil type, check oil level.
☐	**Push Button or selector switch** . . .	Clean, check contacts.
☐	**Relays**	Clean and check for mechanical binding and sticking. Check contacts.
☐	**Resistors**	Check for signs of overheating; if sliders tighten.
☐	**Oil Immersed Devices** .	Drain small quantity from bottom to remove sludge; if much sludge, drain oil and clean. Check level and add; replace oil if black and dirty; check contactor and wipe off carbon.
☐	**Drum Controllers** . . .	Tighten and check for contact wear and overheating; put small amount of vaseline on sliding surfaces.
☐	**Pilot Devices**	Clean and check contacts.
	START THE MOTOR OBSERVING ALL SAFETY PRECAUTIONS FOR DRIVEN MACHINES.	
☐	**Check starting sequence**	Does the control function properly.
☐	**Contactors**	Flash on closing, if so, check for adjustment to eliminate contact bounce.
☐	**Noise**	Check shading coils, magnet surface, sealing, mechanical binding, loose rivets.
☐	**Pilot Devices, Pressure Switches, Temp. Switches** . . .	Check bottom and top limits of operation. Is there any fluttering of contacts denoted by pumping of main contacts.

List any parts which will have to be replaced in the near future.

break and the current increased on the remaining strands. In such instances the lead should be replaced. New leads should be formed by hand so they will take the flexing over the entire length rather than at one point.

Arc shields should be checked to make sure they are in place and not obstructed with dirt. If severely coated with carbon or copper deposits, they should be cleaned.

Some controllers have dashpots which may be air or liquid filled. If oil-filled dashpots, only special dashpot oil should be used. The dashpots should be checked to make sure they are not sticking or binding.

The oil on high voltage oil-immersed contactors and circuit breakers should be maintained at the recommended level and periodically inspected for water, sludging and excess carbon.

Trouble Shooting. There is more to maintenance than just keeping the equipment clean and adjusted. Frequently, because of a malfunction, it is necessary to shoot trouble. The end result of the malfunction is obvious, but the cause is not. Therefore, do not jump to conclusions. Unsuspected pilot devices (pressure, temperature or float switches) may be the source of trouble as in the case of the following reports:

EXAMPLE: *Increment starters controlling a 200-hp, 208-volt part winding motor.* According to the report the starting size, No. 5 contactor welded closed causing the motor to burn out. It appeared obvious to the maintenance people that the fault was with the control. If the size 5 contactor had not welded, then the motor would not have continued to operate on the starting winding, causing the burn-out. The operator stated that a few days previous to the trouble, he heard the starting contactor open and close in rapid succession.

What actually happened was that the pressure switch in the coil circuit of the contactor fluttered on starting, opening and closing its contacts more rapidly than the size No. 5 contactor could follow. The contactor would relax to the point of no pressure and then return to the closed position. At the point of no pressure, the high inrush current drawn by the motor (approximately 1,500 amps) was sufficient to melt a glob of copper on the contacts. When the pilot device finally settled down and ceased its fluttering, the contactor sealed in on this molten glob of copper with the result that it welded. Most likely, the cause of this failure was a fluttering pilot device.

EXAMPLE: *A reduced voltage starter controlling a 150-hp, 208-volt motor.* The timing relay contact welded causing the starting contactor coil to burn out. When the contact welded, the timing relay could not transfer at the end of the starting cycle. The starting coil was half voltage rated and could only stand this double voltage for short periods of time. Actually it was lucky that the coil burned out on the starting contactor or the auto-transformer; otherwise the motor would have been damaged. The operator reported that the starting contactor had banged in and out during starting on several occasions.

Here again, the end result was that the coil burned out because the timing relay froze. In our opinion, a fluttering pilot device caused the starting contactor to open and close a number of times. This high inrush to the coil caused it to burn out and short circuit through the timing relay contact. And this high short circuit current caused the timing relay contacts to weld.

EXAMPLE: *A size 5 increment starter controlling a 200-hp, 208-volts part winding motor.* The starting winding of the motor burned out because the overload relays did not trip. It was further reported that a pressure switch was giving trouble.

The oil pressure switch probably fluttered causing the starting contactor to open and close several times. In this case the flutter was probably slow, permitting the motor to take the inrush on each closure of the contactor. (As soon as the motor started, the

CONTROL TROUBLE-SHOOTING CHART

SYMPTOM	POSSIBLE CAUSE	CURE
MANUALLY OPERATED CONTROLLERS		
Excessive Contact Burning	Low contact pressure, contacts not properly aligned	Adjustment by inspection. On drum controllers adjust star wheel lever spring to center the finger so it strikes the contact squarely
Burning Out Resistors	Starting sequence stopped at mid-point	Instruct operator
Failure to Pick Up	Low voltage on coil	Check system
Failure to Hold In	Coil burned out, or wrong coil	Replace
	Excessive magnet gap	Check gap
Failure to Drop Out	Mechanical binding	Clean and adjust
	Contact welded	See Contacts
	Voltage not removed	Check circuit
THERMAL OVERLOAD RELAYS		
Failure to Trip	Wrong size heater	Check instruction sheets
	Mechanical binding	Clean and adjust
	Relay damaged by short circuits	Replace relay
	Motor and relay in different ambient temperatures	Install motor and control in uniform temperature
Trips at too Low Current	Wrong heater	Check instruction sheets
	Heater assembled incorrectly	Check instructions
	Heater in high ambient	Install relay and controller near motor or in cooler place
	Wrong calibration	Refer to factory
Trips on Starting	Starting cycle of motor too long	Refer to factory
Failure to Reset	Broken mechanism	Replace relay or broken part
Burning of Relay Contacts	Short circuit	Check wiring of push-button in the circuit
	High coil current	Check holding coil current
	Vibration	Remount control
	Dirt and corrosion	Clean and adjust
	Misapplication	Use interposing relay if handling too high coil currents for relay contacts
CONTACTS		
Short Contact Life	Interrupting too high a current	Use special tips or next larger size contactor
	Using oil immersed device when air should be used (Note: Contacts burn many times faster in oil than in air.)	Use air break device if oil is not necessary or if oil is imperative, try heavier duty oil immersed device
	"Bounce" on opening or closing	Readjust contactor for "bounce"
	Abrasive dust	Dust tight enclosure
	Low contact pressure	New contacts and or springs
	Frequent jogging	Larger size contactor
Contact Chatter or Pumping	Poor contact in control circuit	Check connections in control circuit
	Fluttering control relay, such as pressure or temperature switch	Repair pilot device
	Broken shading coil	Replace
	Bad interlock	Increase wipe and pressure on sealing interlock
Overheating	Copper oxide	Clean lightly with file
	Heavy load for more than eight hours continuous operation	Use silver alloy tips
	Overloaded	Reduce load or use larger control
	Weak contact pressure	Clean and adjust. Replace contact spring and contact if wear allowance is used up
	Poor connection	Tighten
Weak Pressure	Worn tips	New tips
	Poor adjustment	Readjust gap and wear allowance
	Low voltage, magnet not sealing	Correct voltage, use lower voltage coil
Welding of Contacts	Poor spring pressure	New springs
	Abnormal currents	Less current, larger device or non-welding contact tips
	Repeated jogging or inching	Controllers must be derated for jogging duty due to severe strain. Use next larger device or tell operator to jog more slowly. Special alloy tips may also help
	Low Voltage—Contact may drop part way open on slow dips of voltage	Raise voltage
	Bouncing of contactor	Eliminate overvoltage and or mechanical difficulties
COILS		
Open Circuit	Contacts not sealing	Eliminate mechanical binding of contactor
	Failure to insert protective resistor on dc	Interlock not making contact – Repair interlock
	Mechanical injury	Replace coil; use more care
	Very rapid jogging	Check application
	Short time rated coil energized too long	Check timing sequence
	Overvoltage and or high ambient	Check circuit and application
Coil Failure	Moisture or corrosive atmosphere	Special coils
SLIDING CONTACTS Used on rheostats, knife and drum switches		
Overheating	Overcurrent, weak contact pressure	Dress copper contacts or use special alloy contacts. Lubricate contacts periodically as recommended.
Excessive Burning	Rapid lever operation	Operate more slowly to eliminate starting across the line which causes burning of contact surfaces and flash-over.
Irregular Surfaces	Lack of maintenance	Smooth over contact surface and lubricate. Do not use emery cloth.
Abrasion	Lack of lubrication	Apply light coat of vaseline
MAGNETS		
Noisy	Low Voltage	Raise voltage or use lower voltage coil.
	Broken shading coil	New shading coil or if face of magnet is worn down, install new magnet frame.
	Dirt	Clean sealing surface of the magnet and bearing points; lubricate with good grade of white machine oil.
	Misalignment	Realign.
Fail to Open	Grease on magnet surface	Clean.
	Misalignment	Realign.
	Contacts welded	(See contact welding).

pressure switch shut off). The starting winding of a part winding motor will not stand rapid repeated starts. This is a type of cyclic load. The overload relays rapidly heat and cool, and as a result fail to follow the heating curve of the motor during repeated starts. For this reason, a motor on cyclic loads can be burned out without tripping the overload relays.

EXAMPLE: *A large industrial firm reported frequent coil burn-outs on a high voltage oil-immersed contactor.* Coils would last a day to a month and then burn-out for no apparent reason. No fault could be found with the contactor so a recording ammeter was connected in its coil circuit. After about two weeks the fault showed up on the chart as many rapid openings and closings of the main contactor. Investigation showed that a fluttering mercury switch caused the contactor to open and close rapidly. In this case, because of the size of the motor and its heat capabilities, no burn-out was experienced; the contactor coil was the weak link.

Trouble-Shooting Chart. Some of the most frequent difficulties common to most electrical control devices are pin-pointed in the trouble-shooting chart accompanying this article. Also shown is a preventive maintenance check list to serve as a guide in setting up a thorough maintenance program.

About the Author

Harry A. Wright, associated with Allis-Chalmers since 1937, is supervisory engineer, general purpose starters, Control Department. Wright was granted a leave of absence to serve with the U.S. Army Signal Corps during World War II, rejoined Allis-Chalmers in 1946 and two years later he was named engineer-in-charge of control sales. He became manager of product sales in the Control Department prior to being named to his present position. An electrical engineering graduate of Carnegie Institute of Technology, Wright has authored numerous articles on control and has spoken before technical groups in his field.

Special Maintenance Report

Synthetic Lube Passes Texas Eastern

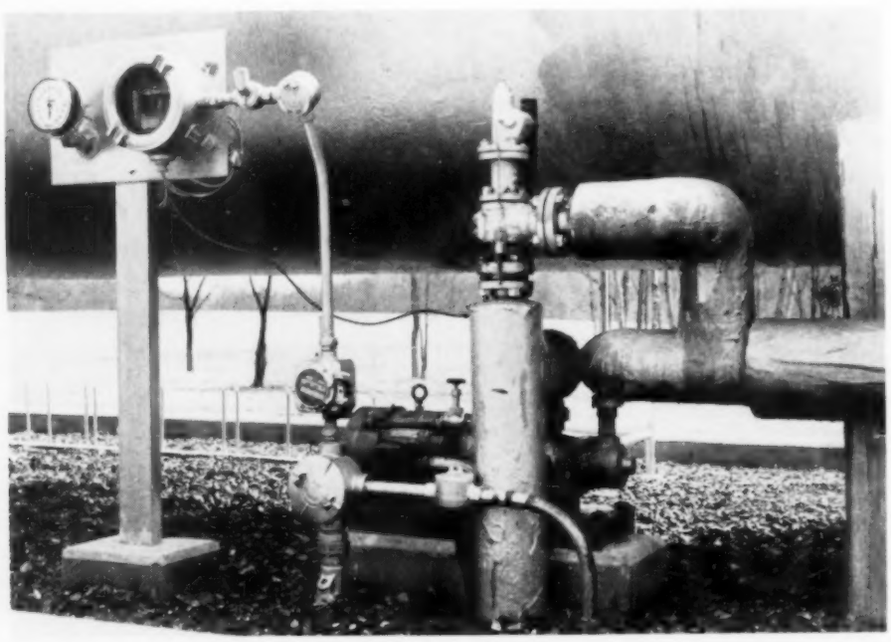
First application of this new phosphate ester for 13,400 hp, unattended gas turbine stations gets engineer's OK. Designers tested chemical, lubricating and fire resistant properties thoroughly before start up

IN THE DESIGN of four unattended single unit 13,400 horsepower turbine stations Texas Eastern engineers gave serious thought to fire hazards. Since the stations operate unattended by remote control from about 28 miles away, they decided to take a good look at synthetic fire resistant lubricants. (See PIPE LINE INDUSTRY, May 1959, Page 26.)

These materials were not new as a lubricant. They had been used in small steam turbines, aircraft jet engines and other special services. However, it was to be the first application of synthetic lubricants in gas turbine compressor units. The big advantages of this family of lubricating fluids is that they will not ignite when exposed to the heat generated by gas turbines.

Lubricant selected for this service is made by a leading chemical manufacturing company. It is a synthetic, phosphate ester based, fire resistant fluid with good lubricating properties. Actually five fire resistant lubricants were tested by Texas Eastern prior to the selection of one. Very likely several of the other lubricants would be suitable for a similar application.

Advance tests were satisfactory. Testing of the lubricants prior to actual start up of the stations had to be complete and also quick because the stations were to start up in the 1958-59 winter heating season. Besides selecting the fire resistant lube oil, it was also necessary to make sure that all parts of the compressor and turbine units with which it came in contact were compatible with the new lubricant. In some cases change out of parts was necessary.



Makeup lubricant is stored in this 3,000 gallon insulated tank adjacent to Texas Eastern's Bernville compressor station. An electric immersion heater installed in the piping maintains temperature at 70° F. The phosphate ester, fire resistant fluid is circulated by means of a 10 gpm positive displacement pump. Recirculating lines are fully insulated

The first tests of the material were to determine its lubricating and physical properties; these were generally very similar to petroleum based oils with the exception of some of its physical properties. It is heavier and more heat resistant, obviously. The phosphate ester fluid selected by Texas Eastern was almost twice as heavy as conventional petroleum lubricants having a specific gravity of 1.4 compared to 0.87 for a typical petroleum based oil.

When placed on the surface of a molten alloy which had been heated to 1500°, the maximum temperature at which parts of the turbine operated, the fire resistant oil did not flash or ignite. Petroleum lubes, on the other hand, may ignite at temperatures of about 700°; of course conventional lubes are safe as long as contained in the proper place in a turbine system.

Flow characteristics. Viscosity of both oils are approximately the same at turbine temperatures. However the fire resistant lubricant has to be kept above 70° to facilitate circulation; its pour point is about 20° above zero.

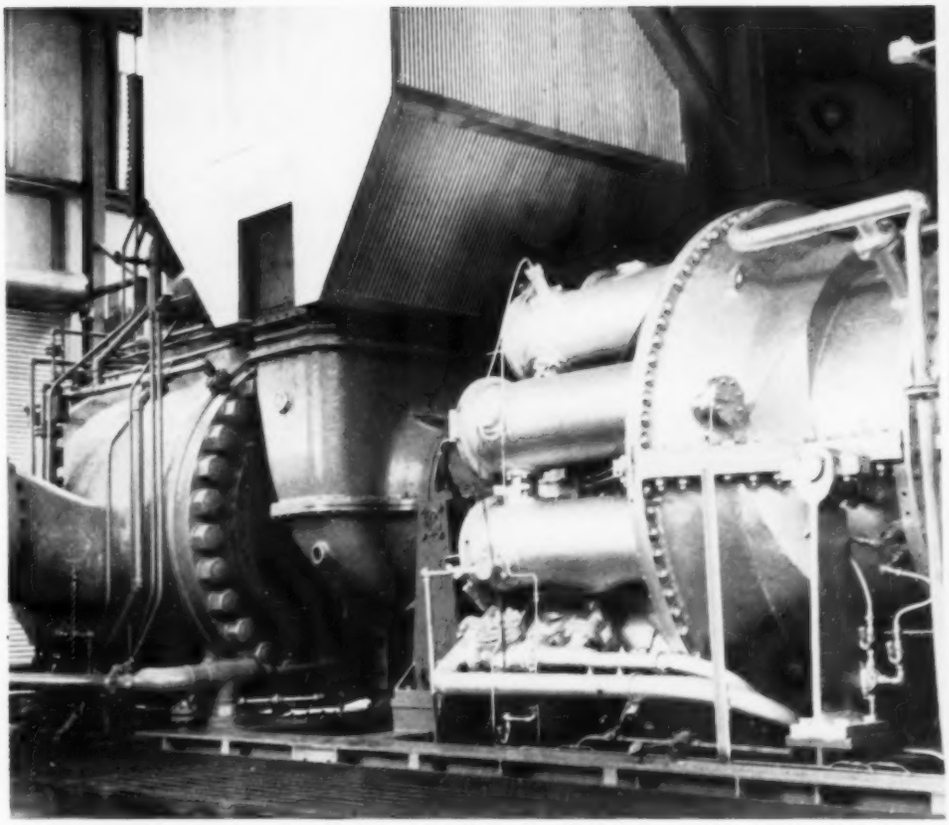
Chemical properties. During preliminary tests Texas Eastern consulted with Battelle Institute, plus both the turbine and compressor manufacturers who took an active part in modification of components to match the phosphate ester lubricants.

Laboratory tests proved that all main and auxiliary bearings, gearing, couplings, pump motors and insulation would be compatible with the synthetic lubricant. In general, filter elements with the exception of certain seals and gaskets and most piping performed well with the new material.

However, some modifications had to be made in the design of the stations. Lube oil piping gaskets had to be changed. New seals and filters had to be installed and the auxiliary and emergency lube oil pump impellers had to be altered to handle the heavier liquid.

Excellent paint remover! While it wasn't intended as such, the phos-

Turbine Tests



Lubricant reservoir is built into the turbine base. Six electric immersion heaters and the turbine room space heaters keep the lubricant at a temperature of 70° F even with the unit shutdown and an outside ambient of 0° F. One lubricant system is used for all parts of the turbine and compressor as well as for compressor seal oil.

phate ester lubricants could make an excellent paint remover in station maintenance. Paint on the walls of reservoir tanks was quickly attacked and loosened. To prevent the pigment from clogging the filters, it was decided to strip the paint from tank interiors and leave bare metal.

In the conversion, rust-proof paint on internal reservoirs was removed with little difficulty. A caustic solution was used to strip the paint taking precautions to make sure that it didn't come in contact with bearings, piping, pumps, control apparatus or other sensitive elements. Paint removing agents were added to water inside the tanks; the solution was kept warm until stripping was complete. It was then pumped out. After fresh water flushing and rinsing, the stripping job was complete. Tanks were air dried and synthetic lubricant was sprayed on all internal surfaces.

Colorless fluid. One of the problems encountered in use of the synthetic lubricant was its clear, water-like appearance which made it difficult to judge gage levels. To overcome this a red dye was added to the oil. Clear plastic cover plates were installed in the reservoir tops to spot any tendency the oil might have to foam during initial start up of the turbine units.

The only other problems Texas Eastern encountered in the use of the oil has been the necessity for making deliveries with heated tank trucks and maintaining temperature of the oil during winter operations. Special care is taken to insure that the synthetic lubricant does not become mixed with petroleum lubes. Although they would be compatible as lubricants, it would lose the advantage of fire resistance to some extent.

Design of the synthetic lubricant system. The lubricating and seal oil system at the four unattended 13,400 horsepower stations provides lubricant for all moving parts of the turbine and compressor and a sealing media for the gas compressor. In addition the flexible coupling, starting turbine and control devices are also served from the primary lube system.

A turbine base lube reservoir maintains a minimum temperature of 70° F. Six electric immersion heaters in the reservoir and turbine room space heaters are designed to hold this temperature even with the turbine shutdown and outside ambient of 0°F.

Makeup lubricant is delivered from a 3,000 gallon capacity storage tank to the turbine sump by controlled air pressure through a filter, a meter and to the reservoir tank. This tank is located just outside of the compressor building; it is completely insulated; an electric immersion heater is installed in the circulating piping. A 10-gallon per minute capacity positive displacement pump circulates the lubricant between the storage tank and the compressor building. Circulating lines are fully insulated.

The lubricating oil cooling system is completely closed. All lubricant from the base reservoir passes through a tube and shell heat exchanger, magnetic filter, a primary filter and a secondary filter before it reaches bearings and seals. All lubricant drains back to the turbine base reservoir.

Heat exchanger modifications. In the original design of the large turbine stations units were to operate with oil to air heat exchangers. While modifying equipment for the low pour point synthetic lubricant, systems were changed to use a lubricating fluid to water heat transfer system within the heated building and subsequent water to air heat exchange externally.

Performance record. Texas Eastern's engineers have been very well satisfied with the performance of synthetic lubes to this point and feel that the added cost of the materials, about four times that of conventional lubricants, is a worthwhile premium for the safety insurance at the giant unattended turbine stations.

Texas Eastern's engineering vice president, A. J. Shoup, reported that after more than 3,000 operational hours with the fire resistant lubricants, their record had been very satisfactory. No difficulties had been encountered resulting from lubricating, physical or chemical characteristics of the product. Fire resistance of the fluids had been proven conclusively in several advance tests. Consumption and general stability had met operating demands. —**The End**

What Research Discovered About Pressure Surges

What with working pressures in crude and products lines going higher and higher and pipe walls getting thinner, preventing pressure surges is more important than ever

By Robert D. Kersten, Assistant Professor
School of Civil Engineering
Oklahoma State University, Stillwater

RESEARCH ACTIVITIES on pressure surges have produced a number of fundamental principles and analytical tools in recent years. The principles have led to a clearer understanding of the pressure surge problem in oil pipe lines. The tools when properly applied will do much to alleviate the surge menace in existing systems and could virtually eliminate it in new systems.

The historical development of surge wave theory, beginning with the work of Joukowsky[1], may be found in the literature.[2,3] Analysis and evaluation of the fundamental research reported in these resumes indicates heavy emphasis on semi-empirical graphical techniques. These techniques have been relatively successful in dealing with transient surge problems involving short lines, lines where fluid friction is negligible and cases where compressibility of the fluid is a relatively small factor.

Continued growth in scope and complexity of pipe line applications, coupled with the continual trend to higher operating pressures, thinner pipe walls and high speed pumping machinery have substantially altered the emphasis on surge problems. The steady state pulsation problem takes on prime importance, although to be sure, transient surge problems cannot be ignored. Long as well as short line problems take on new significance. Fluid friction and compressibility factors play a very important role.

The compressibility factor in petroleum pipe line operations has until recently been a rather nebulous item. A significant contribution in this regard, i.e., the determination of the bulk modulus of compressibility has been made by Kerr, Kessler and Gamet.[4]

Fluid friction. Recent attempts to include the effects of fluid friction on surge waves, i.e., the so-called damping or attenuation factor, have resulted in this factor being very well defined. Binder[5] suggested an approach utilizing the secondary or eddy motion of the fluid; Ludwig[6] assumed the frictional resistance to be proportional to the square of the mean velocity; and Waller[7] related the attenuation coefficient to the exponent of the mean flow. Experimental work, both in the laboratory and field, indicates the Waller theory[8] yields more exact results.

Electrical visualization. Once the compressibility and friction factors were properly accounted for, all items were available to properly orient the so-called hydraulic-electric analogy. It may be shown[7-9] that the relationships between voltage, current, resistance, inductance and capacitance in the electrical system are analogous to pressure, flow rate, resistance, fluid inertia and compressibility in the hydraulic system.

Knowledge of the above mentioned factors and the basic principles of their cause and effect relationships have been firmly established.[8-10] The fundamental mathematical analysis of the extreme fluctuating pressures in pipe line systems has been successful.

In retrospect, the probable reason for the failure of the various water hammer theories to adequately analyze oil pipe line problems is that they were not fundamental enough in their method of attack.

The availability of information pertaining to the hydraulic capacitance (compressibility), inertiance and resistance enables one to write the electrical transmission line equation in hydraulic form:

$$P_x = P_r \cosh \gamma x + Q_r Z_c \sinh \gamma x \qquad (1)$$

$$Q_x = Q_r \cosh \gamma x + \frac{P_r}{Z_c} \sinh \gamma x \qquad (2)$$

where P_x is the fluctuating pressure and Q_x the alternating volumetric flow rate at any point "x" distance from the receiving end "r."

Z_c is a constant defined as the ratio of the product of the fluid density and velocity of travel of the pressure wave to the cross-sectional area of the pipe. Gamma, γ, also a constant, is the vector sum of the attenuation coefficient which embodies the effects of frictional resistance and the phase constant, i.e., the shift in the wave front as the surge wave travels down the pipe.

From Equations 1 and 2,

$$P_x = Q_x Z_x \qquad (3)$$

i.e., ohms law for the hydraulic circuit becomes the defining equation for the impedance, Z_x, to the alternating flow. Inspection of Equation 3 indicates that, once any two of the three quantities are known at a particular point in the pipe line system, the third may be calculated. The fluctuating pressure and alternating volume current may be calculated at other points in the system by application of Equations 1 and 2. Details of such an application have previously been reported in this publication.[12]

Eliminating or minimizing surge. When undesirable pressure surge conditions are found to exist in a pumping system, the pipe line engineer may find a solution through an analysis along the following lines:

First, divide the pipe line system into two parts: the pump which generates the pressure fluctuations and the piping system which responds to the pump excitation. Figure 1 is a general schematic diagram of a pipe line system including an installed corrective device or hydraulic filter.

In the figure, the letters i and o

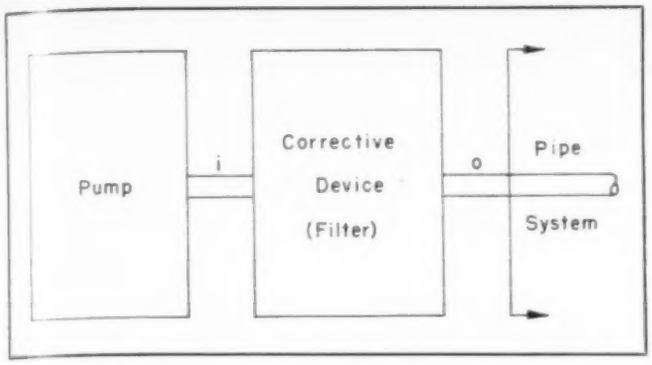


FIGURE 1—Schematic diagram of a pipe line system showing the installed corrective device which minimizes surge damage.

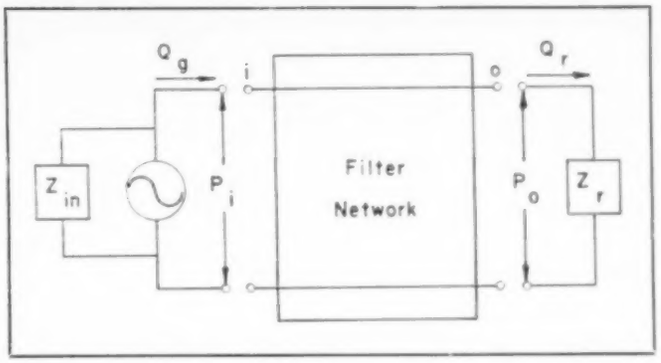


FIGURE 2—Electric analog line diagram enables engineers to visualize the hydraulic problems electrically.

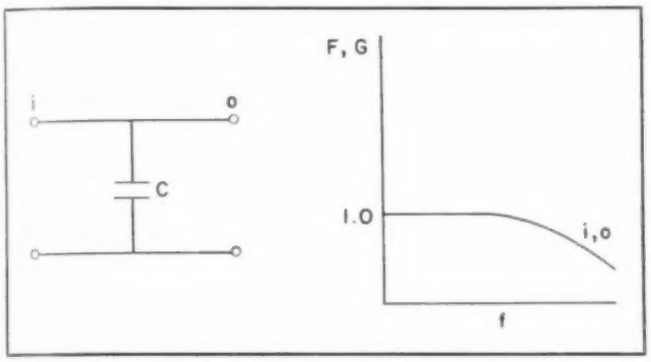


FIGURE 3—Single parallel capacity device with only one parallel loop. It can filter all frequencies. Examples: Air domes, bladder type desurgers or lumped volumes of fluids.

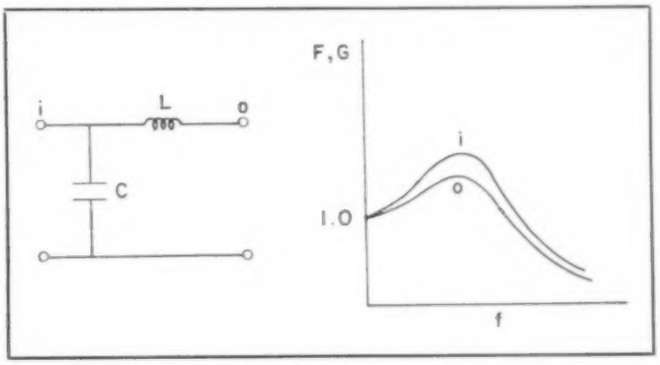


FIGURE 4—Combination of capacitance, C, and inertiance, L. The latter is in series configuration with a larger diameter pipe to smaller diameter pipe to original diameter pipe.

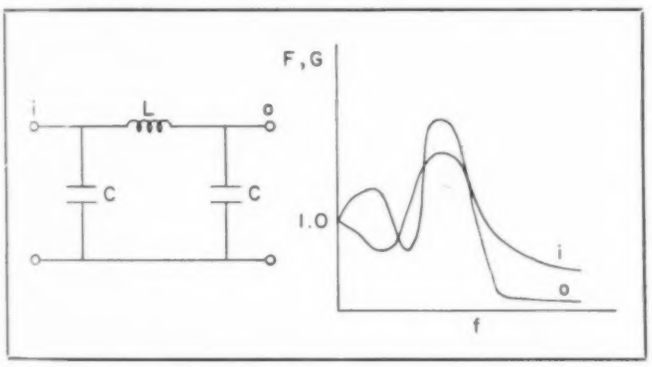


FIGURE 5—Constant k filter, also called the elemental multiple loop filter.

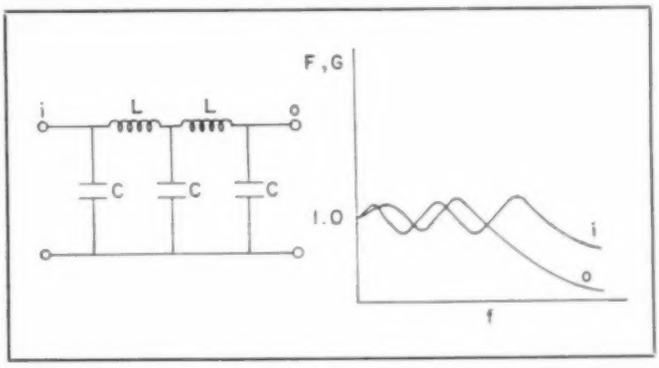


FIGURE 6—Multiple inertiance and capacitance filters—also called multiple L-C loops (top right). As more of these are added, the output indicates an increasingly better attenuation. (Compare this curve with Figure 5).

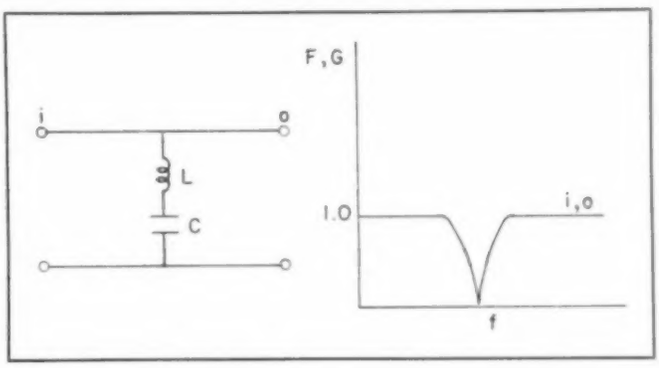


FIGURE 7—Tuned filter (right). This is the only device that could give complete filtering; i.e., F = G = O. If a number of harmonics were present a tuned stub for each harmonic may be acceptable.

indicate input and output sides of the filtering device respectively. Visualization of the electric analog of this system is shown in Figure 2: the pump is replaced by a harmonic source having an internal impedance Z_{in}, and generating a fluctuating volumetric flow or volume current, Q_g; and the pipe system is represented by the receiving end impedance, Z_r, and volume current, Q_r.

The pressure that exists at the start of the piping system is the output pressure at the device, P_o; the pressure at the pump, the input pressure at the device, P_i. These pressures may be thought of as the response to the dynamic action of the fluid. The dynamic property of the fluid system that indicates the severity of the pressure fluctuations is the impedance. In

general, a low (ideal is zero) impedance is the goal of the corrective device. The primary reason for correction being the reduction of the amplitude of the pressure fluctuations.

The measure of effective correction is the comparison of pressures before and after a device is installed. Designating a and b as subscripts indicating after and before respectively the ratio

$$F = \frac{P_{oa}}{P_{ob}} \qquad (4)$$

defines the filter response, F. When the ratio is greater than unity, the device is magnifying the pressure, and when less than unity, the desirable decrease in pressure occurs. The ratio:

$$G = \frac{P_{ia}}{P_{ib}} \qquad (5)$$

indicates the ratio of the surge pressure at the pump (input side of hydraulic filter) after the device is installed to that before it is installed. For effective surge pressure control, both F and G should be less than unity.

Requirements of a filter. The corrective devices may be thought of as being composed of lumped pipe line components for purposes of analysis. Resistance, inertiance and capacitance are designated R, L and C respectively.

Design requirements of corrective devices are partially dictated by practical considerations of pipe line operations. These are:

1. The device should filter over a broad range of frequencies. This means that the device should act as a filter for all harmonics that are significant in the generated volume current. For example, the first, third, fourth and eighth in a double acting duplex pump installation.

2. The device should offer a minimum of interference to the mean flow. A device that creates an excessive additional pressure drop becomes undesirable because of the added power requirements. This restricts the use of series inertiances. A parallel inertiance requires a flow from the main line. This eliminates a lumped parallel inertiance from further consideration. A series capacitance may be eliminated from consideration because it requires complete stoppage of the mean flow. This leaves only combinations of parallel capacitances and limited use of series inertiances as the basic components of practical filters.

3. Any number of combinations of the above components could be used, subject to the cost of fabrication and installation.

4. Special attention should be given to components that involve a minimum of moving parts to keep maintenance at a minimum.

A multiplicity of combinations of resistance, inertiance and capacitance in hydraulic filtering devices have been investigated by Waller.[11] The procedure of analysis is similar to that used in electrical and mechanical filter analysis. Typical response curves for several filters of practical importance are shown below. The response is plotted against frequency of the surge wave.

The main requirement of a successful filter is that the response functions F and G lie below unity as the frequency is increased to infinity regardless of what happens to the curve between zero and the final breakpoint.

1. Simple capacity device with only one parallel loop (Figure 3). This device filters all frequencies. Examples of this type device are air domes, commercial bladder type desurgers, mechanical springs and lumped volumes of fluids.

2. Basic combination of inertiance in series with capacitance in parallel. A device of this configuration has been patented by Ludwig.[10] It consists essentially of a simple capacity device in parallel with an inertiance (larger diameter pipe to smaller diameter pipe to original diameter pipe) in series (Figure 4).

3. Elemental multiple loop filter. This is the so-called constant k filter (Figure 5).

Note that as more reactive elements are added to the network the output becomes increasingly better while the input response is not materially changed. Also, the first element on the input side of these acceptable filters is a parallel capacitance. Filters with the first element composed of a series inertiance are not acceptable because the input response is greater than unity.

4. Multiple L-C loops. Note that as more L-C loops are added the output indicates an increasingly better attenuation. (See Figures 5 and 6).

5. Tuned systems. This is the only device that could give complete filtering (i.e., F = G = O) at a finite frequency. If a number of harmonics were present a tuned stub for each harmonic may be acceptable (see Figure 7).

Obviously, an infinite number of combinations of filter components is possible. A large group is eliminated by consideration of practical operating problems. Another group is discarded due to the fact they do not protect the pump as well as the line side of the device. The remaining hydraulic filtering devices fit generally into one of the above five categories. The pressure response equations used in the filter analysis are ideally suited for solution by digital computer techniques.

The fundamental principals and methods of analysis of steady state pressure surge problems have been established. The techniques of analysis have been applied to corrective devices (hydraulic filters). Future application of these procedures can greatly reduce the damaging effects of pressure surges. The range of application will be limited only by the ingenuity of the pipe line engineer in properly analyzing the pipe line system and properly utilizing the various filter components.

This article completes a special report on research into the problems of surge in liquid pipe line systems. "A New Approach to Pressure Surge Analysis" by Robert D. Kersten was published in the August issue of PIPE LINE INDUSTRY (Pages 46-51).

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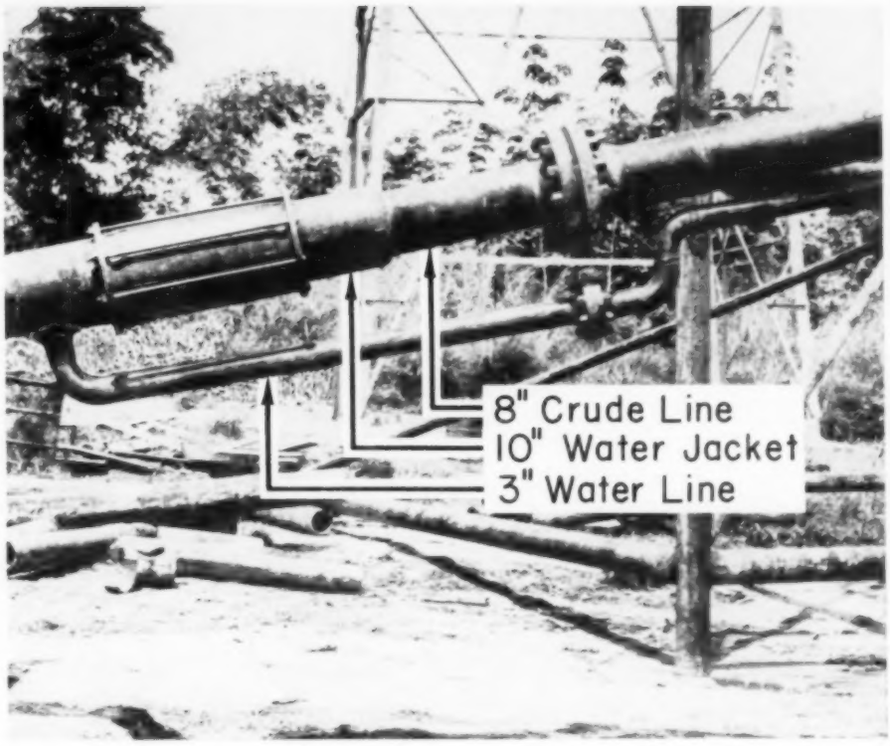


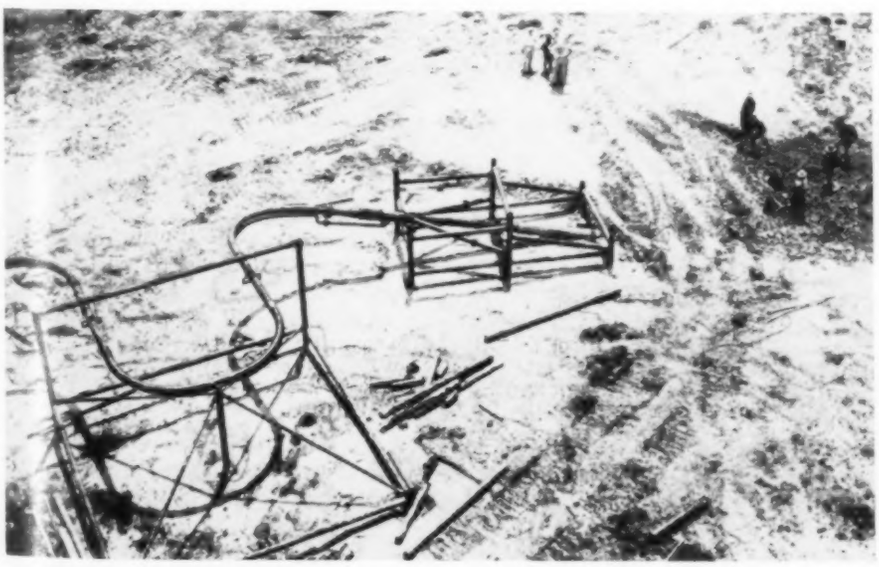
Strange scene on a pipe line. The 8-inch crude line and the 3-inch hot water line have been elevated above the swamp found on either side of the jungle river. For the under-river crossing, the 8-inch crude line is run inside a 10-inch line and the hot water surrounds it. For the most part, the hot water and crude lines are buried in the same ditch.

A 3-inch hot water line in the same ditch keeps heavy crude with 105° F pour point pumpable. Twice, the hot water has thawed freeze-ups

Parallel Hot Water Line Heats Crude In Sumatra Pipe Line

IN THE DITCH below Standard-Vacuum Petroleum Mij.'s 8-inch crude line that crosses central Sumatra, there is a 3-inch hot water pipe line. Its purpose: To keep the heavy crude in the line above it in a pumpable, liquid state, as it flows from the Lirik field to the deep water Buatan terminal on the Siak River. This takes some doing, because the crude has a pour point of 105° F.

On two occasions since the line went in operation on Nov. 1, 1957, Stanvac pipeliners have been faced with a troublesome freeze-up. Both times, they were able to thaw the solid crude by circulating hot water through the 3-inch trace line.

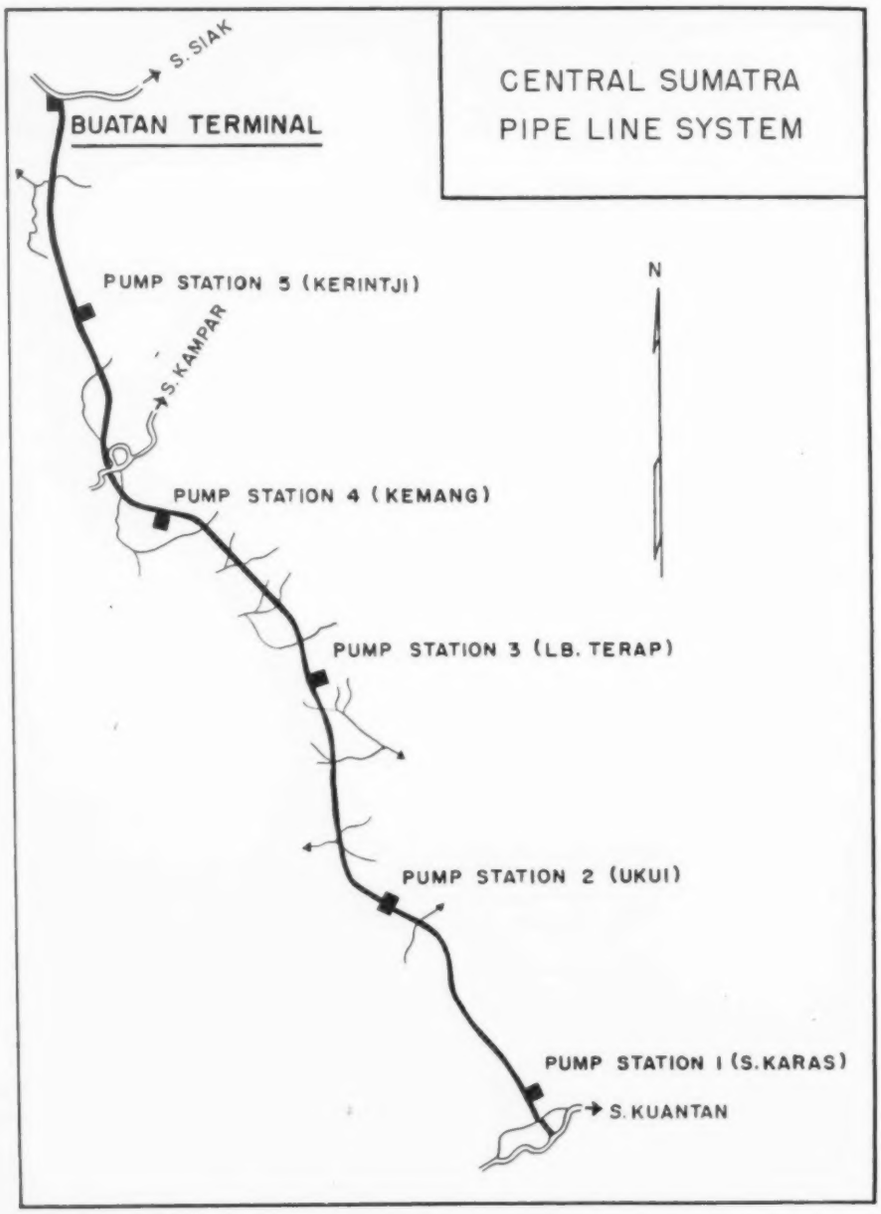


Overhead view of expansion bend on Lirik-Buatan pipe line in central Sumatra at point where separate pipes carrying crude and hot water go underground for a river crossing. Water enters the annulus forming a sleeve of heat within a 10-inch pipe through which the 8-inch crude line passes. Insulation around the 10-inch reduces heat loss to the water.

Brief History. The Lirik pipe line system was started in mid-1955 (see PIPE LINE INDUSTRY, February 1956, page 36). Aside from 20 kilometers of swamps the 150-kilometer line traverses hilly jungle. Rainfall along the route averages about 115 inches per year.

The Lirik fields were discovered in the late 1930s, and but for the abnormally high reservoir temperature (173° F at 1,700 feet subsurface) the recovery of crude would not be feasible by present methods. It congeals at 105 to 110° F. A pool of the crude which will remain liquid while exposed to the direct rays of the sun, can freeze sufficiently during the

Pipe line emerging from ground at Nilo Pankalan. Here the 8-inch line is inside a 10-inch for the river crossing.



Route map. Most of the 150 kilometer right-of-way traverses hilly jungles. Rainfall is 115 inches per year. Station spacing is about 30 kilometers along the line. Each station has four 60 hp boilers for heating the crude and the hot water.

night to support the weight of a man.

Stanvac engineers were faced with a number of choices in designing the system. First thought was to blend the crude with naphtha—35 percent by volume—but this would have required a larger line to move the crude and naphtha to a terminal as well as a return line for the naphtha. Emulsification was considered, too, but the problem of breaking it eliminated it as a possibility. Electrical heaters and other ideas were discarded in favor of simply heating the crude at pump stations and running a parallel hot water line in the same ditch. At river crossings, the carrier line was run inside a hot water jacket.

The 8-inch line is buried to an average depth of 2½ feet and lies over the 3-inch hot water "defroster" line. At many points the two lines are in direct contact.

About 100 kilometers from the first station, the line makes under-water crossings of the Kampar and Nilo rivers; in both instances, the 8-inch carrier line was run inside a 10-inch water jacket. The 3-inch hot water system is tied into the annulus of these concentric lines.

Because areas on either side of the two rivers are inundated during the rainy season, the pipe line is elevated above ground for a total distance of about 5 miles in this area.

Stations. There are five stations on the system. Each is equipped with four 4⅞ by 6-inch triplex skid-mounted pumps. The capacity per pump is 10,700 bpd and the capacity of each station runs 32,000 bpd with a discharge pressure of 1050 psi.

Steam generating and heating equipment at each of the stations consists of four 60-hp fire tube boilers, and there are three crude heat exchangers. Hot water pumps are diesel-driven duplex pumps and 10 by 4 by 10 steam pumps.

Start-up and Operating Problems. In view of the relative complexity of the Central Sumatra pipe line, the start-up was preceded by an evaluation of the defroster system. The section between the first two stations was used for this test. After scraping and pressure testing both lines, water at 180° was pumped through the defroster system until the water temperature inside the 8-inch line became stabilized at the midway point. Actual data validated the design of the defroster system. Crude at a rate

of 5,000 bpd was then pumped into the 3-inch line at an initial temperature of 152° F. After 4,200 barrels of crude (outlet temperature of 90° F) had been received at Station 2, the line was shut down to allow the oil to congeal for an actual start-up test.

Defrosting of this section required only 24 hours after a 10-day shutdown period. Oil was then pumped through the line and arrived at the Buatan terminal on Oct. 30, 1957. On Nov. 1, 1957, the tanker "Stanvac Djirak" lifted the first crude shipment for the Palembang refinery.

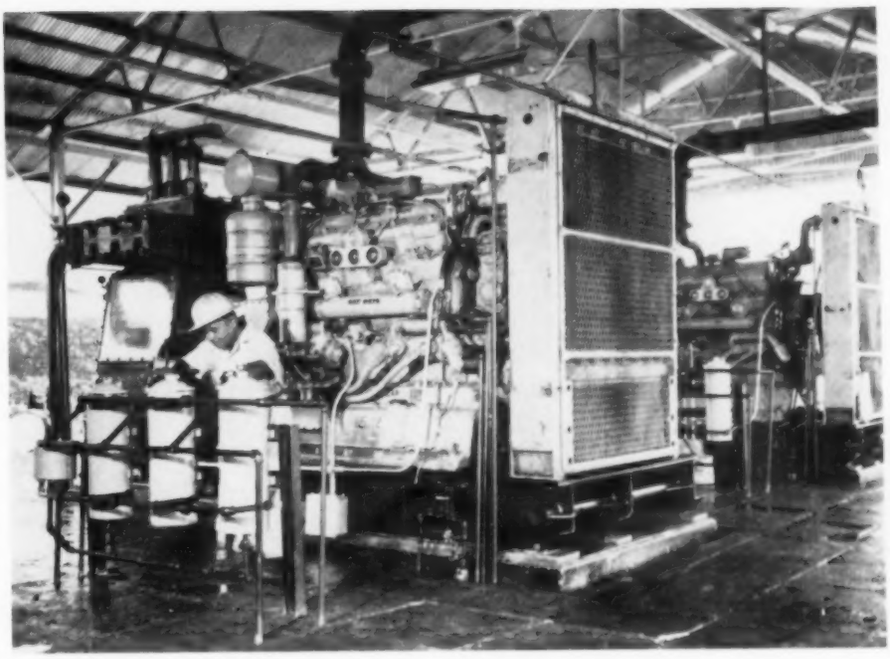
Handling Freeze-Ups. No serious problem developed in the operation of the line until Nov. 29, 1957, when the first "freeze-up" occurred. The primary cause of the "freeze-up" was a low crude oil lifting schedule which in turn required a very low pumping rate. Other contributing factors were:

- **Insufficient line soil cover**
- **Heavy rains which, with little soil cover, accelerated heat loss**
- **Lack of experienced station personnel**
- **Failure of communications during the critical period when a shutdown might have been averted.**

The freeze-up developed between Station 5 and the Buatan terminal. Failure of the personnel to recognize the danger sign of a gradually rising discharge pressure was due to their inexperience and unfamiliarity with the station operations. Proof that the soil cover in this section was inadequate came when normal defrosting operations failed.

The freezing of the line in this section forced the shutdown of the entire pipe line. However, continuous operation of the defrosting system between Station 1 through Station 4 prevented any "freeze-up" of the greater part of the line.

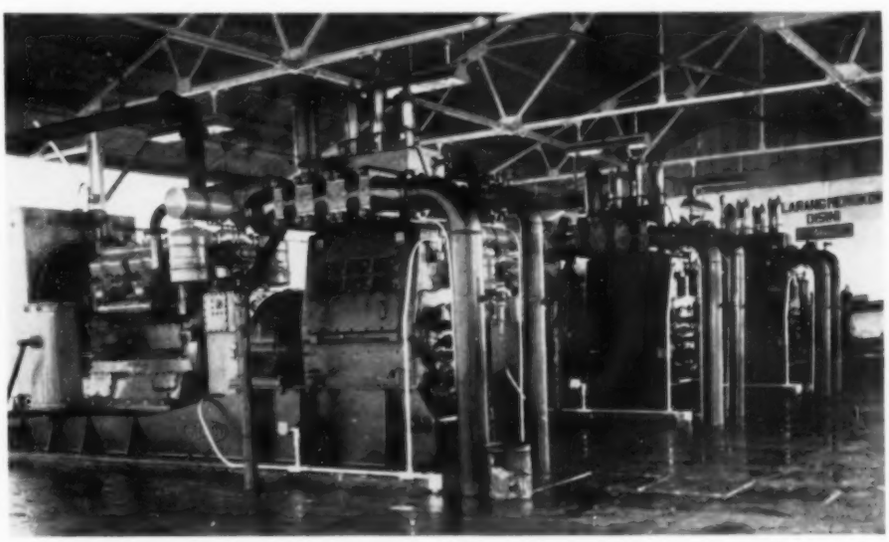
Because of the insufficient soil cover, the defroster system could not supply heat over the full length of the frozen section and therefore other measures were undertaken. Shop-made heating coils were installed alongside the line with the 3-inch defroster tied into the coils. Wood fires were built under the coils to reheat the circulating defroster water. About two days later the crude oil plug was moved at a pressure well above 1,000 pounds psi and flow was gradually restored in this section. Fortunately all stations south of the Kampar River had no difficulty in keeping the crude in a fluid state, and normal pumping of the entire line was resumed.



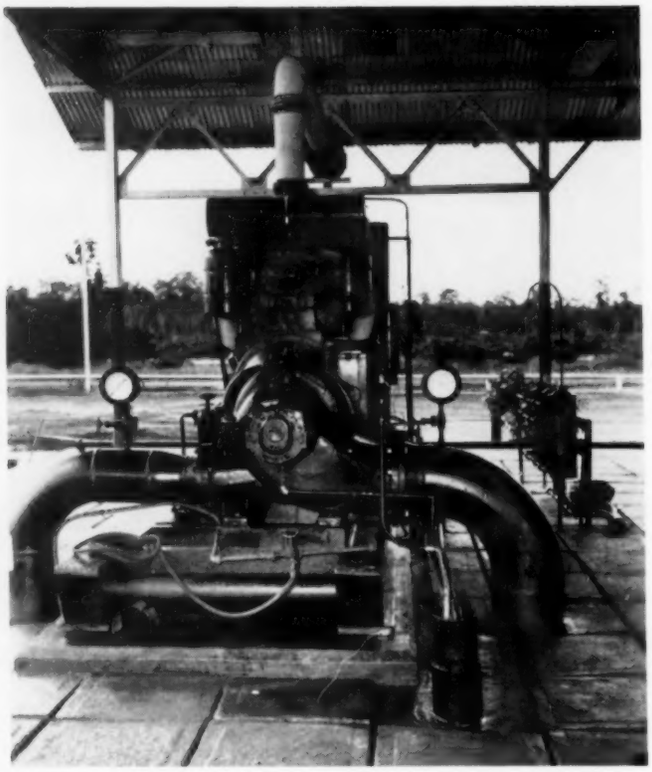
Diesel engine powers triplex pumps. (Station 1 at Sungei Karas.)

The second "freeze-up" resulted in a total shutdown of the entire system. This was caused by political strife in the area, which halted tanker movement on the Siak River. In the hope that shipping could be resumed before the crude in the line solidified completely, the crude was not immediately displaced with water except in the section between Station 5 and Buatan. After it was known that the system would be shut down for a long period defrosting procedures were started but the crude in some sections had already solidified. Wherever possible, crude from the line was displaced into the tank at the next station. Because of high fluid levels in the 10,000-barrel tanks at some stations, not all of the 6,000 barrels of crude in each line section could be displaced. Slugs of congealed crude, varying in length from 3 kilometers to 10 kilometers, remained in sections of the line.

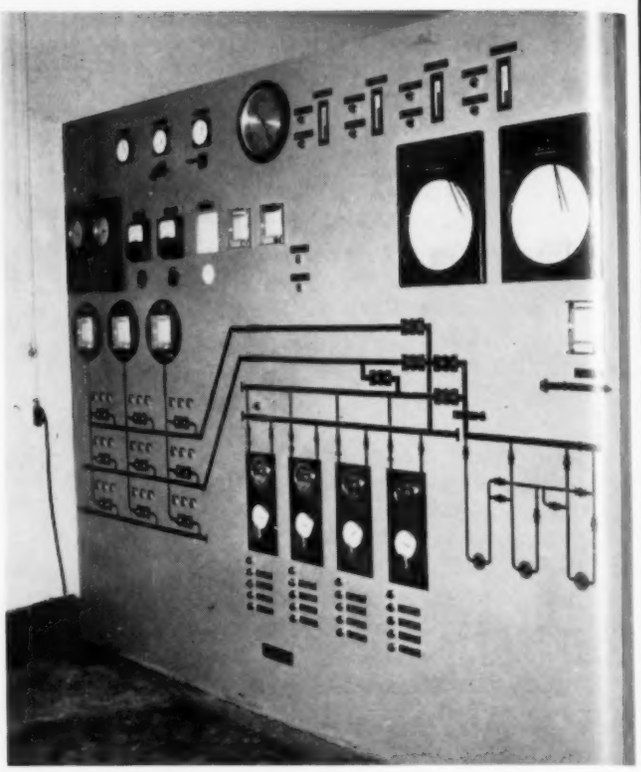
After tanker liftings were resumed, defrosting of the solidified sections was started. The section between Stations 4 and 5 was defrosted first, by pumping about 170 barrels per hour of hot water through the 3-inch line at initial temperatures of 180° F to 200° F. Thirty-six hours were required



Triplex pumps—four at each station move the heavy crude through the line.



Loading pumps at Buatan terminal. Tankers in the Siak river are usually loaded with 47,000 bbls of crude in 9 to 10 hours.



Control panel at Station 1, Sungei Karas.

to defrost this section. The other sections of the line were freed in a similar manner and pumping slowly returned to normal. Water used in displacing the oil was pumped to a ballast tank at Buatan.

Other Problems. While the major concern of Stanvac pipe line personnel has been to guard against freeze-up, other minor operating problems have naturally occurred. These problems—minor in every case—required some equipment changes such as the installation of strain gages to reduce the effect of pulsation on the previously installed pressure transmitters. Also certain test equipment and instrumentation problems have been encountered which required additional test equipment.

Thruput Capacity. In January, 1959, after operations of the line had settled down, and personnel had adjusted to this type of operation, a test was conducted to determine the maximum thruput capacity of the entire line and each individual section. All stations were operated at 1,000/1,050 pounds psi discharge pressure and 150° F discharge temperature. Results of the test showed that the limiting section of the line was between Stations 3 and 4. The maximum thruput capacity of this section was 37,360 barrels per day gross. Imbalance between sections may be attributed to slight differences in length and elevation of sections, variation in buried depth, and different soil conductivities which result in varying heat losses and different pressure drops per kilometer.

From the test data the over-all heat loss for this line was found to be 50 percent less than a surface line indicating the effectiveness of the soil as an insulator. Pressure readings taken along the line indicated an increasing gradient in the down-stream direction as would be expected from gradually lowering temperatures and correspondingly higher crude viscosities. The pressure gradient increased from 30 psi/per kilometer at the start to 37 psi/per kilometer at the end of the section when operating at maximum thruput, an increase of 23 percent.

Terminal Operation. The final step in delivering this high pour crude occurs at the Buatan terminal. At this point the oil is heated to 125° F and loaded on tankers at rates varying up to 13,000 barrels per hour. The T-1 tankers are in port an average of 7 to 8 hours while the larger vessels—47,000 barrels—requires 9 to 10 hours for turnaround. The river at Buatan is 475 feet wide and the maximum length ship in this trade is 425 feet. Night-time operations at the terminal are now routine. The ships navigate the river by using radar, ship-to-ship and ship-to-shore telephones, and search lights.

Operating Results. In conclusion it may be stated that the 150-kilometer pipe line system for the transportation of 105° F pourpoint crude completed by Stanvac late in 1957 has operated essentially as designed. Twice during the history of the line the crude congealed in the line and defrosting was necessary to re-establish pumpability. Measures have been taken to prevent repetition of these occurrences.

At the present time the Lirik to Buatan pipe line system is operating at a thruput averaging 30,000 bpd. As additional crude becomes available, the thruput will increase to pipe line capacity during the fourth quarter of this year.

It is interesting to note that this line, requiring heat to move the crude, is one of the very few crude lines in the world to pump from the Southern to the Northern hemisphere.

—The End

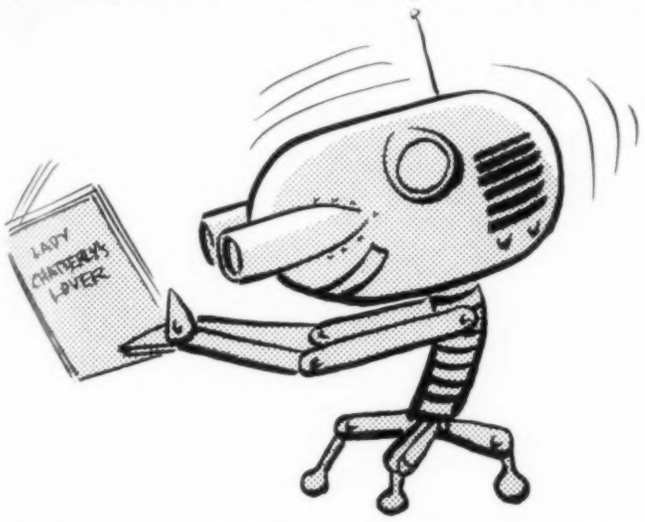
By Pipe Line Pete

IDEAS FOR THE FUTURE!

. . . in pipe line engineering, construction and operations

Now Hear This—Machine Reads Typewritten Pages

A new information machine, called the Print Reader, which reads typewritten pages, has been developed by the United States Air Force Research and Development Command. The new machine, which reads typewritten pages and translates them into electrical signals at the rate of



200 characters per second is an outgrowth of machines developed for one of the major oil companies. This one was made by the Intelligence Machines Research Division of Farrington Manufacturing Company, Arlington, Va.

More advanced than any existing commercial installation, the Reader (officially known as Print Reader MX-2021), is unique in that it reads ordinary typewritten sheets having both upper and lower case alphabetical characters. It even reads punctuation symbols!

The value of the Print Reader centers upon a never-ending maintenance of millions of pages of information which must be processed before being used. All technical information must be indexed and abstracted so that scientists will know the information exists and how to locate it when they need it.

The new Print Reader performs its operation almost instantaneously and accurately, and relieves manpower for more important tasks. With only 30 of these machines, it is possible to read automatically and process information at a rate of 10 million pages a year!

The Air Force's reading machine has only one drawback at present. It can read one type style only. However, research is continuing and promises to achieve reading all type styles in the near future.

Another unique feature of this new machine is that it can ask itself questions—something other electronic machines cannot do. That is, it can test for identification clues, and thus after answering yes or no to a few of its own questions, can make a very "sophisticated" analysis in identifying the pattern.

Farrington Manufacturing Company calls the machine "character sensing," and it is one of 26 models that were put into use earlier by a major oil company.

Gangway for the Steel Balls

Land-clearing bulldozers are a common sight in the pipe line industry; but in Africa, near the Kariba Dam area, a new method is being used. Here gigantic 8-foot steel balls are used to clear dense brushland, and it is a fantastic sight to see three or four of the giant balls ripping down trees and thick underbrush. The balls are honeycombed inside for extra strength, attached to battleship anchor chains, and dragged through the forests by tractors. The cleared area, covering 100,000 acres, will become the fishing grounds and harbors of the large lake that will form behind Kariba Dam.

Research Notes Worth Knowing

Gas-Air Fuel Cell Planned for 1960

Think what a revolution we'd see if the industry develops a fuel cell which will convert natural gas directly into electric power. Already, a number of companies have developed units which use hydrogen and oxygen; in fact, this invention is almost unmatched from the standpoint of thermal-electric efficiency. The only trouble is the high cost of hydrogen and oxygen.

A number of gas companies, including United Gas Corp., the world's largest handler of natural gas, have been working on developing a fuel cell which simply converts natural gas and air to electric power. We may be closer to the solution than you think.

United Gas Invents Automatic Chart Reading Machine

Think of the work involved in reading and calculating the values from thousands of meter charts every day. United Gas developed a machine for reading these charts automatically last year. The pilot model was highly successful and the company is building and testing a full-scale machine. Should it prove successful, another tedious and expensive "hand" job will be taken over by machines.

The company is also developing a linear chart averager.

Vinyl-Lacquer Interior Coating

A vinyl-lacquer coatings was found effective in pro ecting the interior of steel tubing against atmospheric c rrosion during storage, it eliminated the need for cle ning prior to laying and it reduced the pressure drop in p od-ucts and water lines according to the U.S. Army I ngineers. Apparently the only drawback to the coating is hat the formation of gum in fuels takes place at a h her rate than in an uncoated pipe line.

Solion—The Transistor's New Rival

The remarkable solion—the Navy's new electroch mical device that may replace the transistor in many lectronic uses requires 1/100 to 1/1,000 of the p wer required for transistors. The electrical charge is ca ried by ions in solution rather than by electrons as in the vacuum tube and transistor.

The Navy says the devices are highly sensitive to low-energy stimuli. Other features: inherent long life, stability, simplicity of operation, light weight and eas of manufacture.

Got Your Bottle of Sun? You'll Soon Be Carrying One

You may soon be carrying a piece of sun around in a bottle, say CalTech researchers. The so-called "sun bottle" is a vacuum tube about the size of a peanut shell, containing mercury gas. When an electric current is passed through it, the gas turns into a substance similar to the corona that flames out millions of miles above the surface of the sun.

Engineers hope that the "sun bottle" will open up new frequencies that will make wrist radios and space walkie-talkies finally practical. They also hope to learn how nuclear fusion—the key to the tremendous energy of the sun—really works, says Professor Lester M. Field of California Institute of Technology.

Further, because the "sun bottle" can be used to generate tiny microwaves that travel only a few miles before being stopped by the earth's atmosphere, military units on a battlefield would be able to talk to each other without detection.

Many, many other uses are in the offering, say the scientists, and eventually use of the sun bottle could mean a new era in personal and pipe line communications.

Machine Forms Pipe Line in Ditch

This is really pipelining! The ditcher cuts the trench, and a machine behind it forms the pipe—from raw materials—as the spread moves down the right-of-way!

If you're in pipe line construction—relax. We're talking about concrete pipe; but compared with old-fashioned jointed concrete pipelining, this new method is revolutionary.

Here's the way it works. Following the ditcher, circu r metal forms are suspended in the ditch on reinforc g steel, Along comes a hopper with vibrators and mova le forms. It forms the outside of the conduit and after fo r hours the inner metal form is removed through the pi e. Diameters up to 60 inches have been formed in this ma ner. Owner of the new-fangled gadget is South Cent l on-Joint Pipe Co., of Rocky Ford, Colo.

Confidential Checklist Measures Boss-ability

These Cities Service employes write what they want about their supervisors, but an independent firm tabulates the answers. The results are paying off, too—for both the company and its supervisors

By **M. D. Poteet,** Coordinator of Management Training
Cities Service Oil Co., Bartlesville

THERE IS a great deal of evidence in business today that productivity of people is largely reflected by how they feel about their supervisors. In many cases, workers spend more of their waking hours with their foremen than with anyone else. Therefore, you can easily see how important it is for these workers to want to do their jobs.

With this in mind, you can also see how important it is for the supervisor to do his job—that is, to get results through people. He is the key man in your operation, and his net worth to the company is measured by his ability to get results.

Taking these points into consideration Cities Service decided that supervisors could improve themselves if they knew what kind of a leader they are to those they supervise. In order to determine this, the company decided to use a check list. Actually, what this check list does is give the supervisor a birds-eye view of how he appears to his workers. The list is composed of 38 questions covering qualities of a good leader and is entitled, "Does Your Supervisor Do These Things?" The questions can be answered "Yes" or "Should Be Improved."

Entirely Voluntary. After a preparatory conference is held, usually at supervisory levels, they are asked the question, "Would you like to use this method to find out what kind of a leader you are?" This question is not superfluous since it is entirely voluntary on the part of the supervisor to participate in this program. However, with the exception of 2 or 3 people within a few months of retirement, everyone has participated. The point is, however, there was absolutely no pressure whatsoever put on anyone.

After the supervisor elects to use this method, he is given a form for each employe he directly supervises. With each form there is an addressed and stamped envelope so that when the employe checks the form he can put it in the envelope and mail directly to a consulting firm in New York. This firm tabulates the results on each supervisor, makes up a single report, then mails it personally back to the supervisor.

Strictly Confidential. These results go only to the supervisor concerned, as he is the only one in Cities Service who sees the results. We stressed the confidential nature of this report to both the supervisor and the employe. For just as it is voluntary for the supervisor to pass out the form, it is

Table 1
Areas Where Supervisors Need Most Improvement

1. In making frank appraisal of employes' work and keeping them informed as to how they are doing
2. Keeping his people well informed of objectives and results of the company and of the department
3. In giving instructions clearly and concisely
4. Training employes in how to do their work
5. Showing he knows and understands the people who work for him
6. Getting all the facts before making decisions
7. Expressing himself well
8. Making decisions promptly
9. Making it easy for employes to ask questions
10. Showing he understands the job he supervises

voluntary on the part of the employe to complete it.

The employe is impressed with the idea that no one in the Cities Service organization sees the form after it has been filled out by him. Therefore, there is no opportunity for anyone to know what he says or checks on the form. As a matter of fact, we ask the consultant to change the wording on the remarks portion so as to hide identity of an individual.

The supervisor passes out the form to each employe, personally wherever possible, telling him that he hopes he will help by giving his frank opinion in order that he, the supervisor, might improve.

The Payoff. Now you may be asking yourself, "Just what is the payoff in a program of this type of Cities Service, since they do not see the report on the supervisor?" Well, we believe that if you are to get good results through others, you need to know how they feel about you. This being the case, really no one but the supervisor can do anything about this and then he must have a desire to change and improve. Therefore, there is really not any good reason why anyone other than the supervisor should see this report.

There is another payoff to this program, and that is we receive from the consulting firm one composite report on all the supervisors. We usually conduct a series of conferences in each location where we have a concentration of employes and these conferences are composed of from 30 to 60 supervisors. We receive a composite result on such a group.

After receiving the composite reports, we compile a report covering all of our supervision throughout the company, which reflects areas in which further supervisory development training is required.

The report received by each supervisor is strictly confidential and what he does with it is up to him. However, we offer to counsel with him after he receives the report, but only if he requests such an interview. The first year about 50 percent of the supervisors requested interviews; about half of these had very good reports and the other half indicated considerable improvement needed.

In this interview we discuss ways in which they might improve. This year, practically all of our supervisors are discussing their results, and none have lost their enthusiasm in trying to improve. Cities Service will not use these check lists again next year, but will consider them again the following year.

Improvement Started. Table 1 shows the 10 areas where supervisors need the most improvement. Therefore, we have begun to take care of these areas one at a time. From question number one, "Makes frank appraisal of employe's work and keeps them informed on how they are doing?" it is quite obvious that workers are anxious to find out how they are doing on their jobs. In other words, they want to know the same thing as the supervisor asked of them—how they appear to their boss. Therefore, this was the first area we worked on.

The question appearing in the number two position, "Keeps his people well informed of objectives and results of the company and of the department?" clearly indicate a need for better communications. As a result, we are now holding communications conferences with all of our supervisors, discussing the various phases of communications— the written word, the spoken word, how we communicate, what we are to communicate as well as case studies and role playing communications.

From the Top Down. We have been quite pleased with the enthusiasm that has been evidenced in this check list program by both supervisors and employes. One factor we feel was very important in the acceptance of this program was the fact that we started with the president and the Board of the company, then worked our way down through the ranks of supervision and management to the frontline supervisor.

As mentioned earlier, we have begun to try and take care of the first two items in Table 1 and it is our intention to assist our supervisors in improving on the others as time permits. We realize, however, that the broadside approach will not suffice, therein lies our reason for personal counseling with each individual. However, as you might expect, there are superfluous as well as conflicting questions due to the fact that all employes are checking the forms from vice presidents to oil field roustabouts, refinery personnel, and all the various divisions of an oil company throughout our operating areas.

We also found that what might be important to people in West Texas might not be as important to people in Chicago, Canada, or Bartlesville, therefore it is necessary for some of the questions to be superfluous in nature. You may be assured, however, that human relations is important, regardless of the level or location. Therefore we must continue to strive to improve this area to keep up with technical advances made in our industry. —**The End**

About the Author

Mark D. Poteet is coordinator of management training, Industrial Relations division, Cities Service Oil Co., Bartlesville, Okla. He is a member of the American Society of Training Directors, Kiwanis Club, American Legion, and serves on API's committee, Training Refining and Production divisions. With Cities Service four years in the Purchasing department as buyer before attaining his present position, Poteet was formerly with Ajax Pipe Line Corp. and Cherokee Pipe Line Co. He has studied at several universities.

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Miscellaneous

—39—Energy Conversion Data For Estimating

The accompanying table gives the high heating values of practically all commonly used fuels along with their relation one to the other.

Example: If light fuel oil will cost a potential industrial customer 18 cents per gallon and natural gas will cost him 75 cents per Mcf, which fuel will be more economical?

Solution: Assume the operator would use 10,000 gallons of light fuel oil per year at 18 cents per gallon. The cost would be $1,800. From the table, 10,000 gallons of fuel oil is equivalent to 10,000 x 134 = 1,340,000 cubic feet of natural gas. At 75 cents per Mcf this would cost 1,340 x .75 = $1,005.

The burning efficiency of both fuels is the same. The savings by using natural gas would come to $795 per year.

FUEL	Heating Value	PERCENT BURNING EFFICIENCY			Unit	NUMBER OF CUBIC FEET OF NATURAL GAS EQUIVALENT TO 1 UNIT OF OTHER FUEL		
		Domestic	Commercial	Industrial		Domestic	Commercial	Industrial
Natural Gas	1000 B.T.U. per Cubic Foot	75	75	78	Cubic Foot	1	1	1
Propane	91,600 B.T.U. per U.S. gallon	75	75	78	Gallon	91.5	91.5	91.5
Butane	102,000 B.T.U. per U.S. gallon	....	75	78	Gallon	....	102	102
Light Fuel Oil	134,000 B.T.U. per U.S. gallon	65–75	75	78	Gallon	117–134	134	134
Heavy Fuel Oil	146,000 B.T.U. per U.S. gallon	....	75	78	Gallon	....	146	146
Hydro-electricity	3,412 B.T.U. per Kilowatt Hour	100	100	100	Kilowatt Hour	4.549	4.549	4.549
*Coal	8700—11,000 B.T.U. per pound	55–60	65	73	Pound	6.37—8.07	7.55—9.57	8.45—10.7

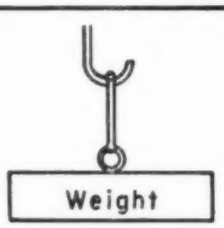
* Coal qualities vary considerably. The figures given are average for Western Coals; slack, run-of-the-mine; potentially available at lowest cost.

Pipe Line Construction

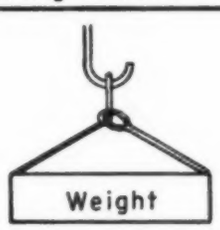
—20—Safe Loads For Wire Rope, Chains

There are various kinds of wire rope and chain available today, and where it is possible it is always a good idea to look up strength factors before using any particular kind. But, the tables here will suffice on construction jobs. They allow for a safety factor of four as based on mild plow steels, etc. Where the wire rope is made of improved plow steel, etc., it will have a greater safety factor.

Safe Loading Factors For Wire Rope And Chains

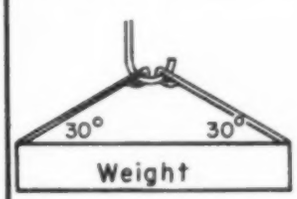


SINGLE PART LINE



SINGLE PART-CHOKER HITCH

TWO PARTS



TWO PARTS

Dia. In.	SINGLE PART LINE			SINGLE PART-CHOKER HITCH			TWO PARTS			TWO PARTS		
	Wire Rope (Tons)	Alloy Chain (Tons)	Wrought Chain (Tons)	Wire Rope (Tons)	Alloy Chain (Tons)	Wrought Chain (Tons)	Wire Rope (Tons)	Alloy Chain (Tons)	Wrought Chain (Tons)	Wire Rope (Tons)	Alloy Chain (Tons)	Wrought Chain (Tons)
¼	.5	....	....	.35	....	....	.6	....	....	.35	....	....
5/16	.5	1.3	....	....	1	....	....	1.8	....	....	1	....
⅜	1	2.3	.8	.75	1.8	.63	1.4	3.1	1.1	.8	1.8	.64
7/16	1	3	1.1	....	2.4	.9	....	4.2	1.5	....	2.4	.9
½	1.8	4	1.4	1.4	3.2	1.1	2.4	5.6	1.9	1.4	3.2	1.1
9/16	1.8	5	....	....	4	....	....	7	....	....	4	....
⅝	2.8	6	2.2	2.1	4.8	1.8	3.7	8.2	3	2.2	4.8	1.8
¾	3.9	7.8	3.2	2.8	6.2	2.6	5.2	10.7	4.4	3	6.2	2.6
⅞	5.2	10.4	4.3	3.7	8.3	3.4	7	14.4	6	4	8.3	3.4
1	6.6	13.8	5.7	4.6	10.8	4.6	9	18.7	7.8	5.2	10.8	4.6
1⅛	6.6	17.8	6.7	....	14.2	5.4	....	24.7	9.3	....	14.2	5.4
1¼	9.7	23.	8.3	6.6	18.2	6.6	13	31.9	11.5	7.5	18.4	6.6
1⅜	9.7	....	10	....	....	8	....	....	13.9	....	....	8
1½	13.2	....	12	9.2	....	9.6	17.3	....	16.6	10	....	9.6
1⅝	13.2	....	14	....	....	11.2	....	....	19.4	....	....	11.2
1¾	17	....	16	12.1	....	12.8	21.5	....	22.2	12.4	....	12.8
1⅞	20.6	....	21	15.4	....	16.8	26.7	....	29.1	15.4	....	16.8

How to do it

PIPE LINE HINTS

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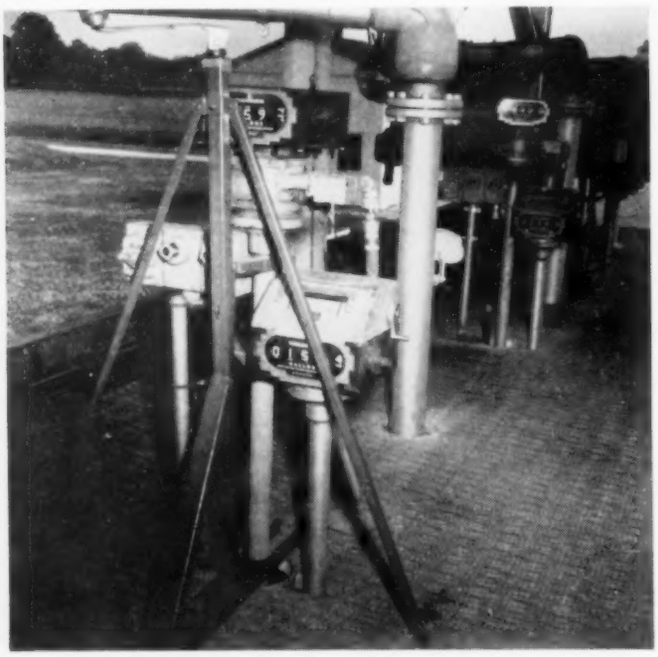
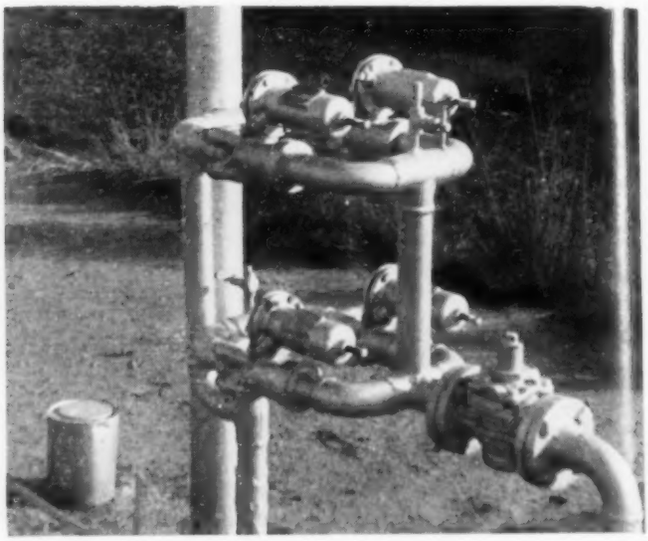


Bumper Jack Aids in Changing Volumetric Meter Shear Pins

A broken shear pin on a volumetric meter calls for a time consuming repair operation. The meter must be dismantled to replace the pin. But an ordinary bumper jack will speed repairs. Fit it under the meter head on the walk above the meter; loosen cap screws and replace the pin in a one-man operation.

After the jack is inserted as shown, the operator removes the cap screws below and then lifts the head enough to change out the pin. Long dowell pins are fitted into two of the holes. With the jack in down position the first cap screw is installed. The dowell pins are then removed and cap screws replaced.



Regulators Connected in Parallel Smooth Gas Flow

For an industrial gas load where the tap-off pipe line pressure is not more than 350 psi and the reduced outlet pressure does not exceed 350 psi, one pipe line company uses two sets of spring loaded regulators, connected in parallel and stacked one above the other, as shown.

With such an arrangement one-fourth of the gas volume passes through each regulator.

A small valve to which a pressure gage can be connected for measuring the inlet pressure is welded to the tee between the bottom pair of regulators; a similar valve for making a gage test on the outlet side is welded to the tee on the top pair of regulators.

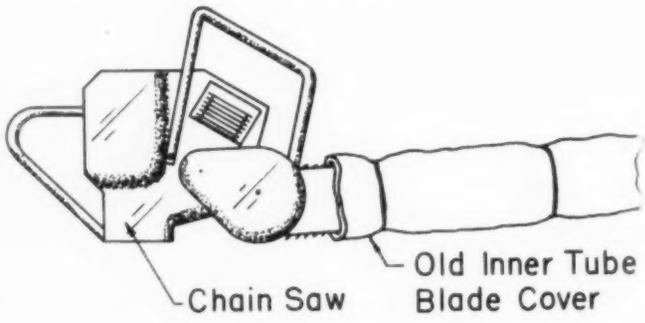
Such an arrangement of regulators makes for smooth even flow on the reduced pressure outlet side, without pulsation or uneven flow as sometimes happens where a single large volume regulator is used.

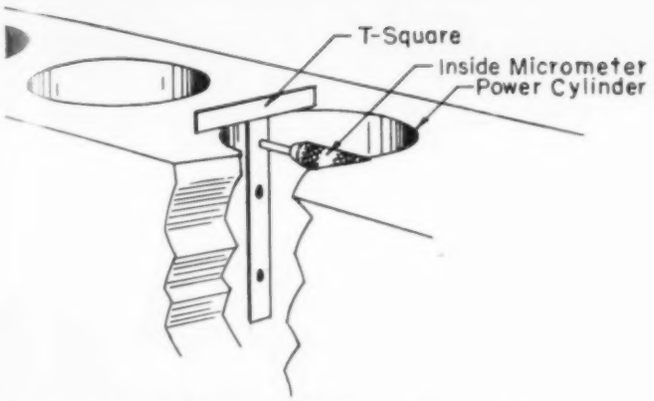
Another benefit: the regulator requires no further adjustment after once being properly set.

Old Inner Tube Provides Guard For Chain Saw Blade

If ever tubeless tires totally replace those with inner tubes, we will have lost a valuable addition to every-day maintenance. Inner tubes can be used for almost anything!

You can make a guard for a chain saw blade by simply cutting a length of old truck inner tube and slipping it over the blade. Cut the tube some 12 inches longer than the blade, and cut several bands to hold the tube on the saw. This will protect the saw from damage and users from injury when the saw is not being used.





How to Mike Cylinders in The Same Place Every Time

Micrometer readings taken in power cylinders each overhaul are meaningless unless they are taken in the same place each time. If you doubt this, try shifting the micrometer around in the cylinder to see just how many different readings you can get.

In addition, the temperature of the cylinder has a great deal to do with the readings. The point is this: How to take readings in the same place each overhaul and calibrate them with those of previous overhauls?

There is a simple solution. First, find a means of taking readings in the same place each time and take at least one of the readings in the area where there is no wear (above the piston travel).

One way of doing this is to make a stainless steel "T"-square of ¼ x 1-inch strap. Drill holes at specific points in the blade—say at 1, 6 and 10 inches—or any other desirable measuring interval. Each time you mike a power cylinder, orient the T-square to a position which can be precisely located each time, then run one end of the mike through the holes. Level the micrometer each time before taking a reading.

This practice will enable maintenance men to compare each group of readings—first with the no-wear area (which gives an indication of temperature error, etc.) and then in the identical spots of previous readings. With these meaningful readings, the time for re-sleeving power cylinders can be predicted ahead of time.

Purge Pipe Line With CO_2 Before Burning and Cutting

Rash bravery for the company's sake is more apt to be rewarded with a pink slip these days than with a pat on the back and a promotion. The cost of "come hell or high water" pipelining runs less than the added insurance claims.

Take, for instance, practices used in the past on making tie-ins and modification to existing piping. Pipeliners would attach the beveling machines, station a man nearby with a fire extinguisher and blast ahead with the work so-to-speak. The insurance claims, the days of missed work ran up high costs—certainly high enough to more than pay for proper precautions such as this one:

Before you start beveling and cutting a line, tap it in a place or two and purge the gas and vapors with CO_2. The cost is low; the danger of fire is non existent. There are variations to this practice. One company recently had the problem of making long longitudinal cuts on a road casing that had been filled with oil. To eliminate the fire hazard, the company inserted a hose from the CO_2 bottle in one end between the casing and the pipe line; packed mud around the pipe to seal off the end and proceeded to purge oil vapors, air, etc. from the annulus before starting operations.

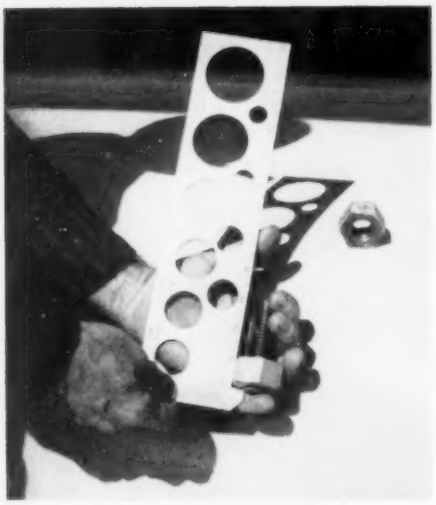
Old Truck Converted to Pipe Handling Crane

Give a good welder plenty of rainy weather and a warm place to work and you are likely to come up with some startling innovations. The pipe handling crane shown here is an example.

Everything about the original truck was altered or moved with the exception of the engine and the wheels—as a matter-of-fact two wheels were added at the rear to give the "crane" more bearing area and traction in soft ground. Notice that the seat was turned around and the steering column re-located.

The A-frame and guy wires are similar to those of ordinary draglines or cranes; the winch is the original one that came with the truck.

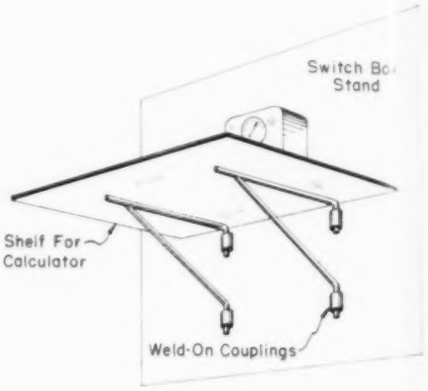
It should be pointed out that this is a stiff-leg crane—mobility from side-to-side comes through maneuvering the truck.



This Template Will Help Solve Warehouse Problems

Mix up a thousand or so of various size studs and hex nuts and you have a storekeeper's nightmare—a not too uncommon one at that. Visit a warehouse after a construction job and you'll see just such a situation. In the warehouse, the storekeeper will be measuring studs and hex nuts then thumbing through a catalogue to find their description. Such questions as, "how do you measure the diameter of a stud—from the top of the threads or the bottom?" keep popping up.

But there is an easy solution to this problem. Simply construct a template like the one shown here. Size the holes to fit the various diameter studs, and mark off a scale on the side in half inches. When you cut out the template, which can be steel, plastic or wood, be sure to leave a hook on the bottom to facilitate measuring.



Light Steel Table Fits On Pipe Stand

A light steel table made of an 18 x 18 piece of ¼-inch plate and two lengths of ½-inch rods, can come in handy in calibrating meters and doing other maintenance and operating jobs.

On the pipe stand, or any upright length of steel in a desirable location for the table, weld two ½-inch couplings about 12 inches, one above the other. On the plate that will serve as the table top, weld two ½-inch rods, deformed as shown. To mount the table in position, simply fit it in the ½-inch pipe couplings.

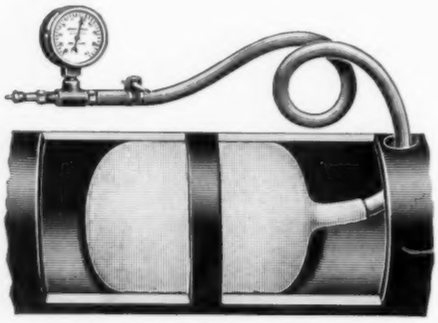
This arrangement has proved highly successful in calibrating meters where it is desirable to have a calculator on hand. Once the job is finished, the top can be removed and stored in the meter building, etc.

Wrap Emergency Key in Aluminum Foil — Bury It

There's nothing handier than a spare key when you need it. So why not get spares made for critical locks, wrap them in aluminum foil and bury them near the lock itself. For that matter why not do the same for the house key? Bury a spare in the flower bed, and you'll never get locked out! But be sure to bury the key some specified distance from a marker, else you'll be digging flower beds in the middle of the night.

PIPELINE INFLATABLE STOPPERS

BALLOON-TYPE



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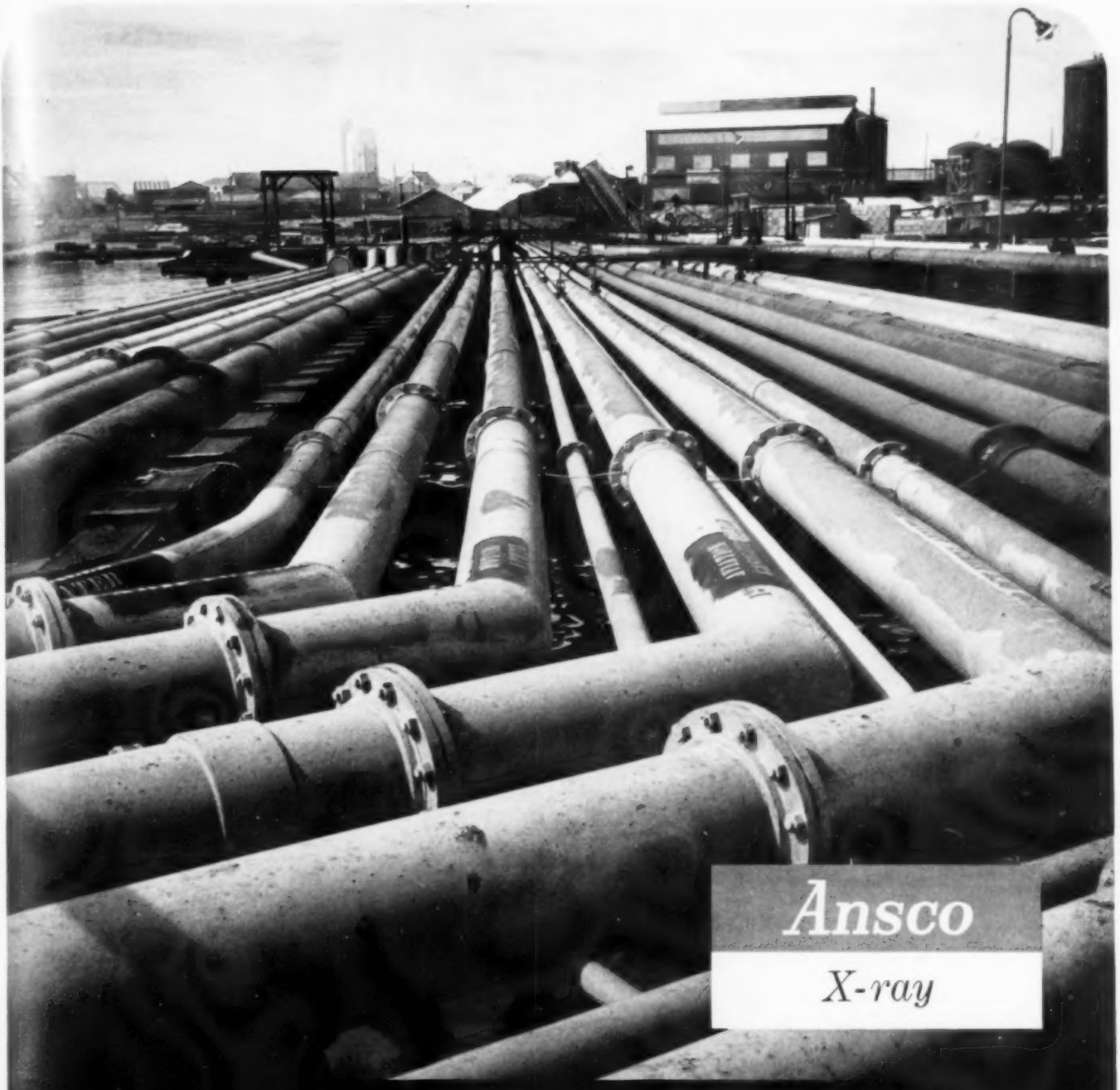


Ansco Films . . . built for pressure

Whenever welds are produced to withstand high pressures, inspection procedures become highly critical. Even the most elusive flaws must be detectable in a clear and decisive manner.

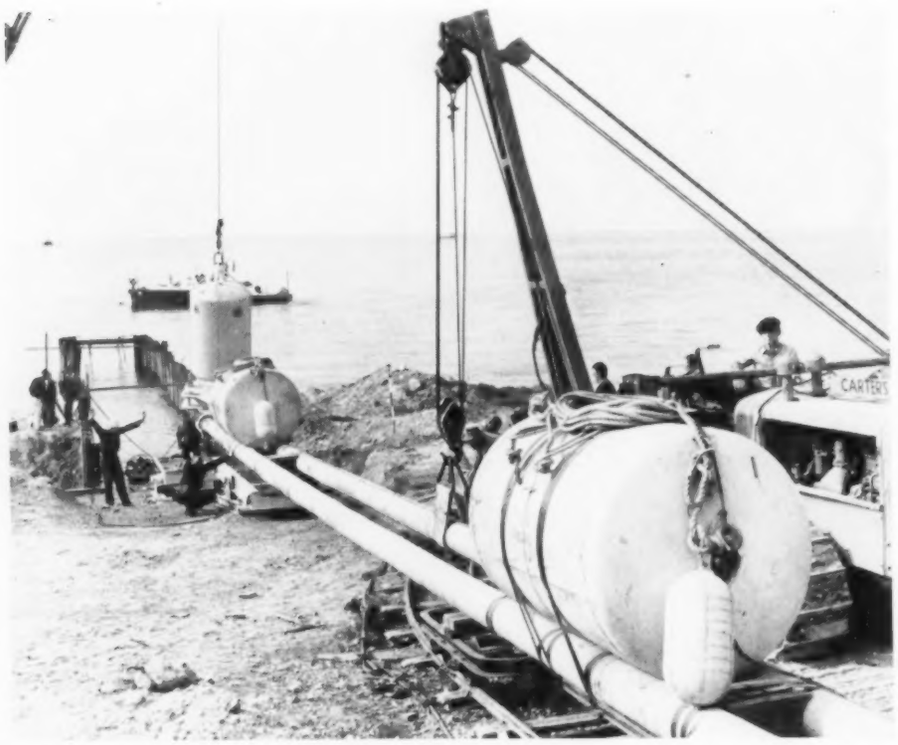
That's only one reason why critical pipeliners prefer the clean gradation and high readability that Ansco X-ray films provide. First sheet or thousandth sheet, Ansco films are uniform in speed and density. The result? . . . total predictability of performance—an important factor when rapid operation and sure flaw detections are needed.

Ansco produces three great films for industrial use; Superay 'B' for medium speed—extremely fine grain uses, Superay 'A' for high contrast, fine grain applications, and Superay 'C' for high speed, wide latitude production work. Three emulsions that give you unlimited control and versatility in any detection problem. Try them soon . . . they are *all* built for pressure. Ansco, Binghamton, N. Y., A Division of General Aniline & Film Corporation.

WHAT'S HAPPENING

IN PIPE LINE CONSTRUCTION

By Donald G. DePugh, Construction Editor



British Atomic Waste Pipe Line Launched

Collins Submarine Pipelines Ltd. pulls first pair of 1,200-foot sections of 12-inch pipe into the sea. A 6-inch carrier, inside the 12-inch pipe, will dispose of radioactive waste from the Winfrith Heath research station. The 12-inch line will carry non-radioactive effluent. The 7-mile line, which extends 2 miles offshore, will be completed by November. Ten pulls of 1200-foot sections were required for the offshore segment. The 6-inch lines have a 0.50-inch wall thickness

Transwestern Pipeline Company Receives Federal Power Commission Authorization

Construction should begin soon on Transwestern Pipeline Company's $192 million gas pipe line from Texas-Oklahoma to California. The Federal Power Commission approved Transwestern's proposal, but conditioned the certificate upon filing of new rates.

Transwestern will request the FPC to ease conditions upon which it authorized the project.

In authorizing 14 producers and one pipe line company to sell to Transwestern, the commission ordered that several of the initial rates be reduced.

According to the original proposal, Transwestern would buy gas from the West Texas-Permian Basin area and Panhandle-Hugoton area for prices ranging from 12 cents to 23 cents per Mcf. The FPC conditions include: Gulf Oil Corporation's sale of Puckett-Ellenburger gas, 44.9 percent of Transwestern's committed reserves, reduced from 12 to 11 cents per Mcf. Also, the pipe line company must pay for costs of treatment of this gas at 4 to 8 cents per Mcf. Other reductions include Richardson & Bass' sales in Winkler County, Texas, from 21.8 to 18 cents; Union Oil of California in Eddy County, N. M., from 20 to 16 cents; nine sales in Panhandle-Hugoton area from 23 to 17 cents; and Warren Petroleum Corporation in Wheeler County, Texas, from 23 to 17 cents.

The commission authorized Cities Service Gas Companies' sale at 21 cents from its pipe line to Transwestern's upon filing of a satisfactory rate schedule and service agreement.

Transwestern's revised rate schedules and tariffs must present adjustment reflecting the reduced cost of its gas supply; a separate schedule of rates and charges for sale of excess gas; a modified minimum bill eliminating the high minimum provisions proposed; and an increase in the commodity components of its rates, if desired, to offset the elimination of high minimum bill provisions.

Contracts have been awarded for construction of the 1,809-mile system extending to the Arizona-California border at Topock, Ariz. Houston Contracting Company, R. H. Fulton & Company and H. C. Price Company will lay the 670-mile, 30-inch section and over 600 miles of 24-inch; Brown & Root, Inc., and Mid-Valley Constructors will build the six stations along the route.

A Transwestern spokesman said that the line should be in service a year after initial construction begins. The transmission company will deliver 300 Mmcf of gas daily to Pacific Lighting Gas Supply Company.

Texas Illinois Files Plans On Major Expansion Program

Texas Illinois Natural Gas Pipeline Company has submitted an application to the FPC seeking permission for construction of 371 miles of 30-inch loops along its 1,400-mile system.

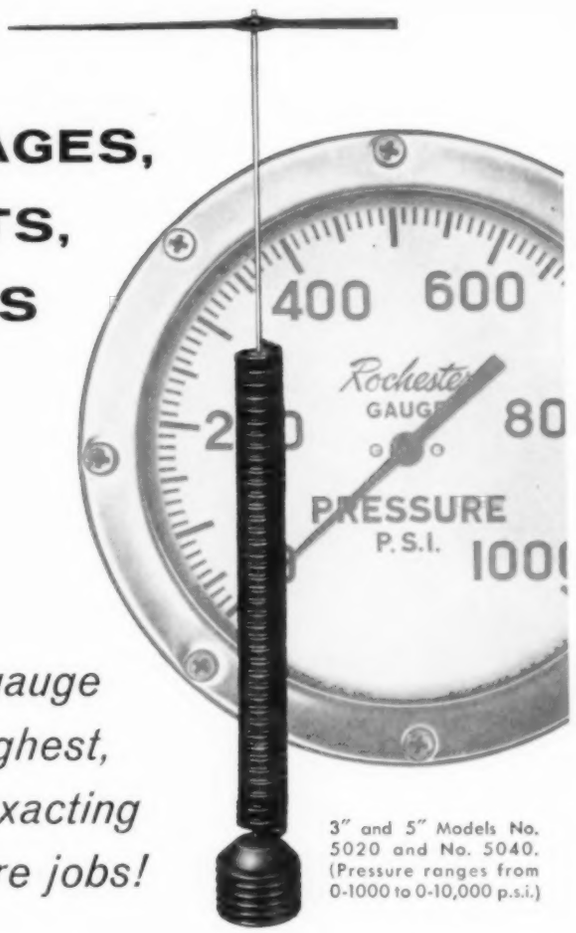
The $43.5 million construction proposal would allow TING to supply an additional peak day delivery of 85 Mmcf of gas per day to markets in Kansas, Nebraska, Iowa, Missouri, Illinois, Indiana and Wisconsin.

The loop lines would consist of six intermittent sections; plans also call for about 45 miles of laterals and a 6,700 horsepower compressor station in Victoria County, Texas.

Texas Illinois has another application before the FPC requesting approval to increase its system by 20 Mmcf of gas daily by installing 16,000 additional hp to stations at Lufkin and Marshall, Texas; Texarkana, Malvern, Searcy and Biggers, Ark.; Jackson, Mo.; and Hammond, Ill. The $4 million project was filed April 1958.

Revolutionary New ROCHESTER HIGH PRESSURE GAUGE has pointer connected directly to pressure element

NO LINKAGES,
NO PIVOTS,
NO GEARS
to wear,
waver
or lag



This is the gauge for your toughest, your most exacting high pressure jobs!

3" and 5" Models No. 5020 and No. 5040. (Pressure ranges from 0-1000 to 0-10,000 p.s.i.)

Now you can practically eliminate maintenance, replacement, and gauge failures—even under the most severe of high pressure service conditions. The new RMC Gauge, models 5020 and 5040, actually approaches the reliability and dependability of the fittings and valves used in pressure equipment.

It is the first pressure gauge to have the pointer directly connected to the pressure element, without linkage or pivots, and with no gears or hair springs.

The pressure element is a multiple turn bourdon coil, to which the pointer is permanently attached at one end. As pressure increases, the end of the coil rotates, moving the pointer with it.

The bourdon coil is made from small diameter tubing. Therefore, the pressure forces against the coil are reduced; the mechanical stress on the coil is less; and spring life, cycling life, overpressure, and endurance are all vastly higher than the conventional "C" type bourdon tube gauge.

For safety, long cycling life and continued accuracy under extreme conditions of overload pressures, high vibration, shock and line pulsation, the new RMC High Pressure Gauge is the one complete answer. Available in pressure ranges from 0-1000 to 0-10,000 p.s.i.; dial diameters 1½", 2", 3" and 5". (1½" and 2" models are eccentric pivot-drive types.)

Write, wire or phone for complete information.

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New RMC Gauge Most Sensitive to Pipe Line Pressure Changes

You know the value and importance of high pressure gauges if you have ever stood in front of the gauges at a receiving station while waiting for a change in cut. All of a sudden the needle jumps and you know that the new product has come over the hump and is on the way in.

Here's a graphic example of what a responsive pressure gauge can tell you. Whether it's a change in cut, leakage, pump failure, temperature rise, or control of a stripping delivery, pressures tell you the line story.

RMC High Pressure Gauges are particularly suited to applications where maximum sensitivity to pressure changes without lag is important, where continued accuracy, rugged dependability, and resistance to vibration is essential.

Instead of the usual C tube which must be linked to the pointer by mechanical means, the RMC gauge uses a multiple turn helical tube or hollow spring. An increase in presure which tends to straighten the "C" tube, will cause the helical coil to turn. Because the pressure-induced distortion is distributed over a much greater length, it becomes obvious that any possibility of permanent change, even due to overpressure, is virtually eliminated.

It also becomes obvious that the pointer can be directly connected—and welded—to the end of the coil, providing an accurate indication of any pressure change without resorting to linkage, pivots, hair springs or any of the trouble-causing elements. The pointer can be rotated for a full 290°.

Having no linkage to wear and cause needle flutter, the RMC gauge is particularly resistant to vibration.

Because a small diameter tube may be used, it will also be seen that the RMC gauge will be more sensitive to slight changes in pressure.

Write, wire or phone any Rochester Manufacturing Company representative . . . or write the company directly for full particulars. Rochester Manufacturing Co., 207 Rockwood St., Rochester 10, N. Y.

Northern Natural Gas Company Begins Construction on $114 Million Project

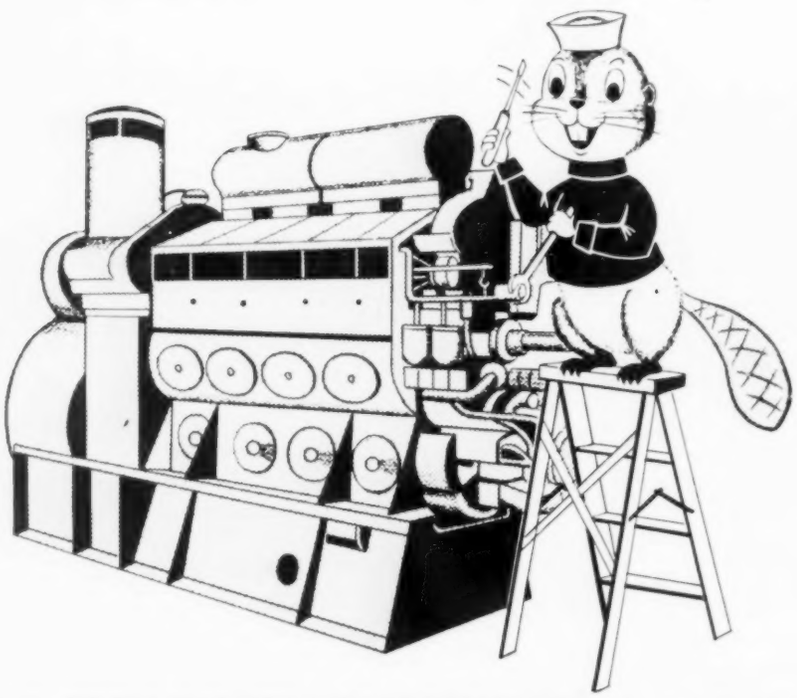
Northern Natural Gas Company has begun construction on its $114.6 million expansion program in Minnesota, Iowa, Wisconsin, South Dakota, Nebraska and Illinois.

Northern will lay 430 miles of 20, 24 and 30-inch main lines, over 2,178 miles of branch lines and add 57,400 horsepower included new stations at Waterloo, Iowa, and Farmington, Minn. The FPC approved Northern's project along with Iron Range Gas Company's proposal to construct additional facilities to take gas from Northern.

Contracts have been awarded to Williams Brothers Company and R. H. Fulton & Company on a Northern Natural 168-mile extension to Duluth-Superior. Williams Brothers will lay 78 miles, 20-inch; 11 miles, 16-inch; and 77 miles of 10-inch in Minnesota and a crossing of the St. Louis River. Fulton's contract calls for construction of 94 miles of 20- and 24-inch and 55 miles of 16-inch in Minnesota. Pentzien, Inc., has been awarded a contract for construction of a crossing of the Mississippi River near Hastings, Minn.

Through its expansion, Northern will begin service to 342 new communities in the midwest. Iron Ranges will construct about 180 miles of 3- to 12-inch lines at a cost of $7.6 million.

In conjunction with Northern Natural's application, the FPC also approved proposals by El Paso Natural Gas Company, Permian Basin Pipeline Company and Phillips Petroleum Company to supply gas to Northern Natural. Permian will increase its sales to Northern Natural by 50 Mmcf daily raising the total of 475 Mmcf. El Paso will supply an additional 50 Mmcf per day to Northern Natural, with gas purchased from Phillips. Phillips will abandon sale of 50 Mmcf to Northern Natural and El Paso will acquire facilities used by Northern to receive this gas.



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Pipe Line Co. May Take Oklahoma-Arkansas Gas

Petroleum Leaseholds Gas Pipe Line Corporation of Houston is considering the possibilities of laying a pipe line to take gas from the Oklahoma-Arkansas-McAlester Basin area.

Several companies have made studies on the gas field in the vicinity and are considering building gathering systems to move the gas to interstate transmission systems.

Arkansas Valley Gas Exploration Trust is considering laying a 16-inch line from Fort Smith to Searcy. No definite plans have been announced by any of interested firms.

Humble Awards Contract For 42-Mile Gas Line

Humble Oil & Refining Company has let contract to H. B. Zachary Company for construction of a line from Humble's King Ranch plant to Alazan Creek, Texas. The line will consist of 42 miles of 20- and 24-inch.

Collins Construction Company To Lay Magellan Strait Line

Collins Construction Company has a contract to lay a submarine crude line across the Straits of Magellan to Tierra del Fuego. The line will connect mainland oil fields in Chile with a terminal on the island.

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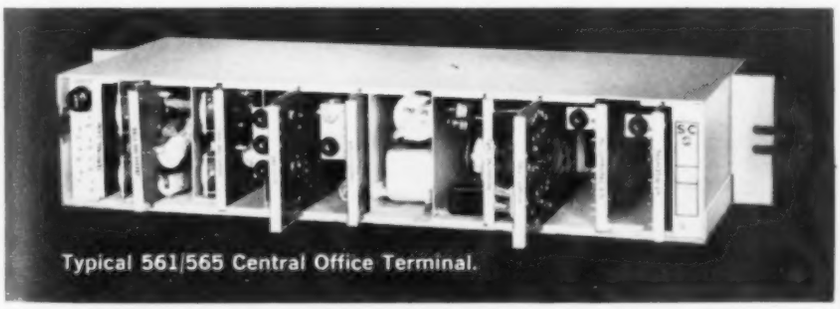
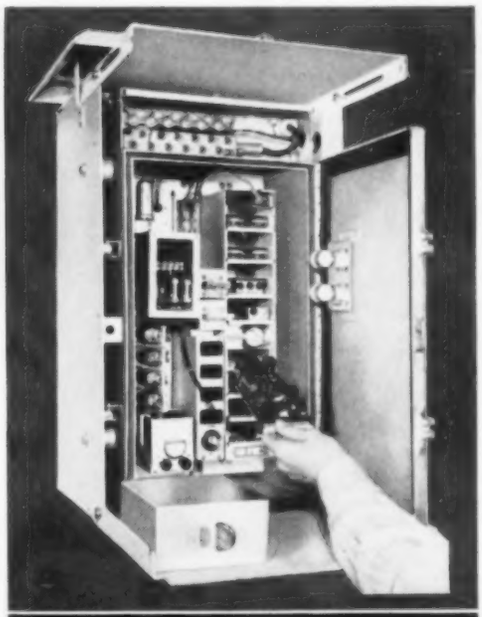


Typical 561/565 Central Office Terminal.



Typical "561" pole-mounted unit.

- "565" Trunk Carrier with E and M signaling: Transistorized for compactness and low power requirement • Provides more circuits over existing facilities • Frequencies: 27-135 kc • Double-sideband operation • Uses the latest telecommunication techniques • Virtually maintenance-free • Easily converted to "561" Carrier . . . **Available now.**

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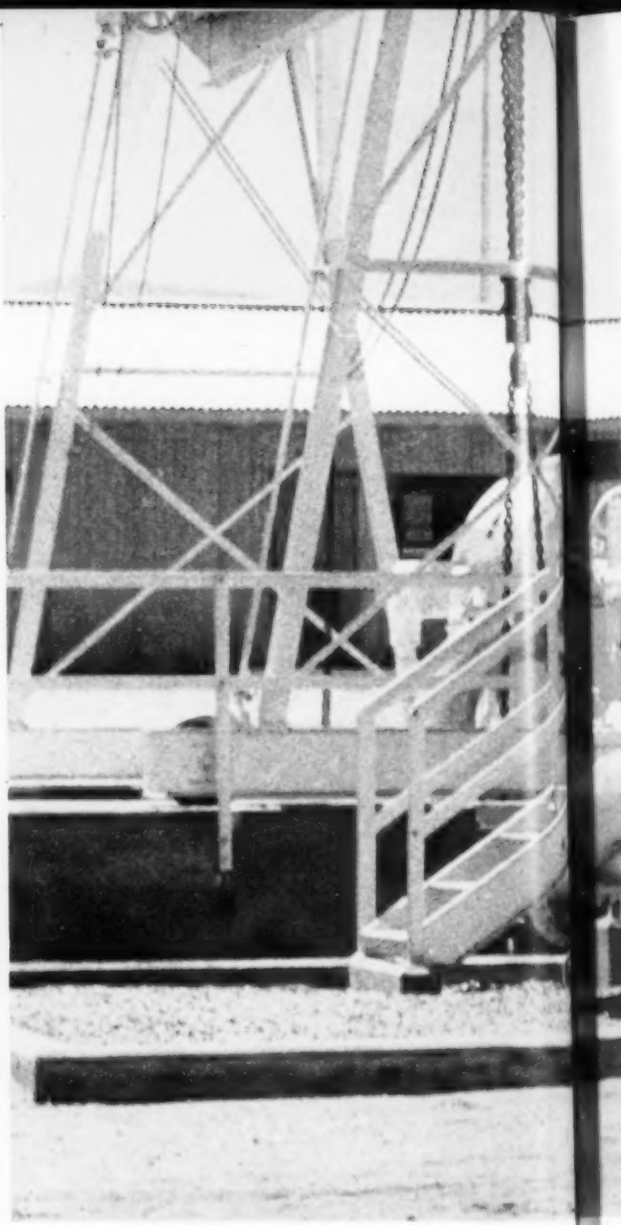
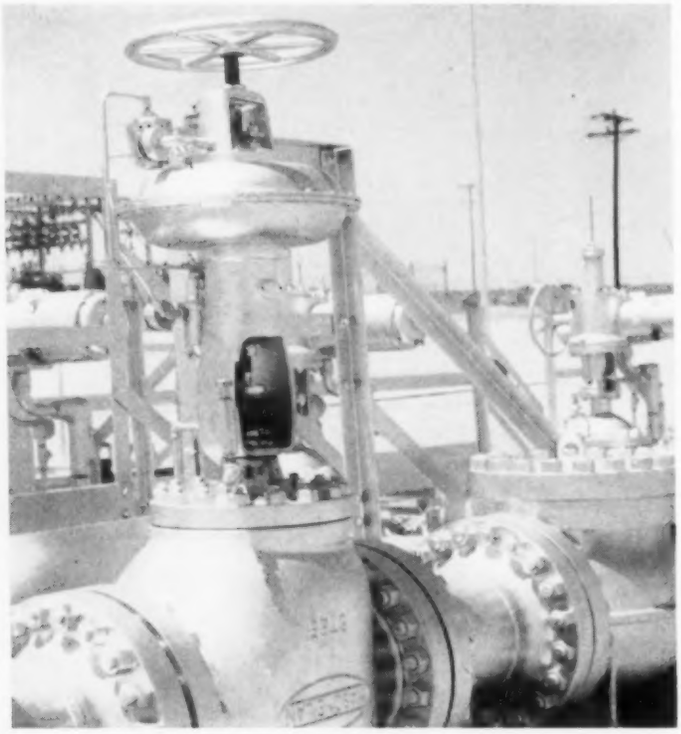
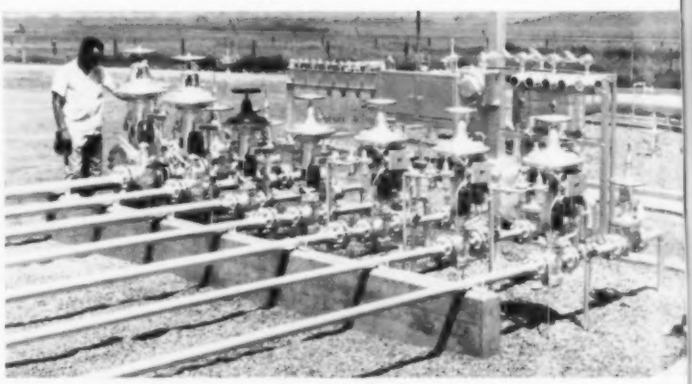
Masoneilan Butterfly Valves, equipped with pneumatic positioner, used on gas pipe line auxiliaries.



Masoneilan Percentage Piston Control Valves with Series 2800 Controllers.

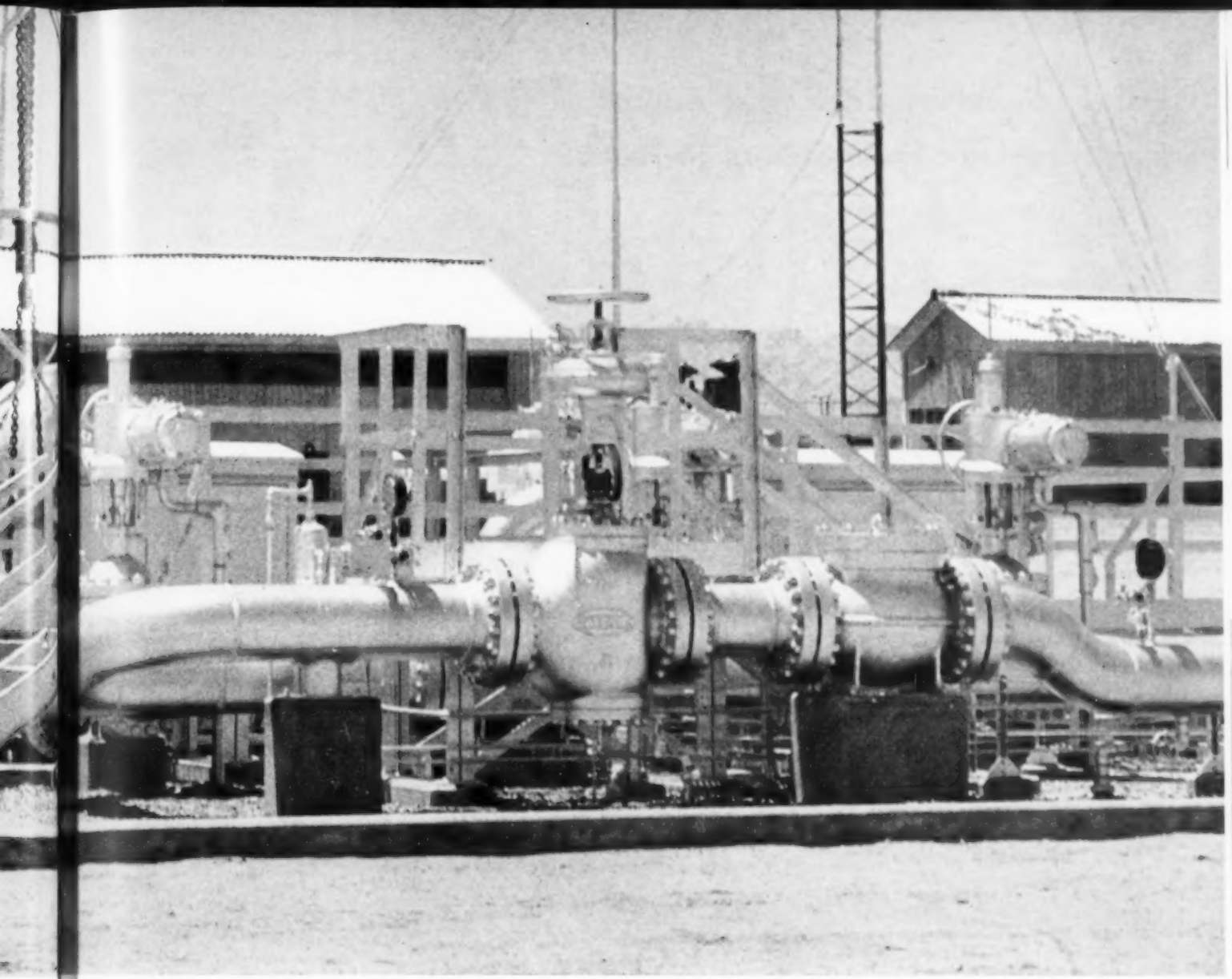


10,000 Series Control Valves at Pipe Line Pumping Station.



Masoneilan Control Valves provide flexibility in obtaining desired pressure differential in friction tube bundles at a Pipe Line Station.

2700 Series Controllers mounted on 10,000 Series Control Valves.



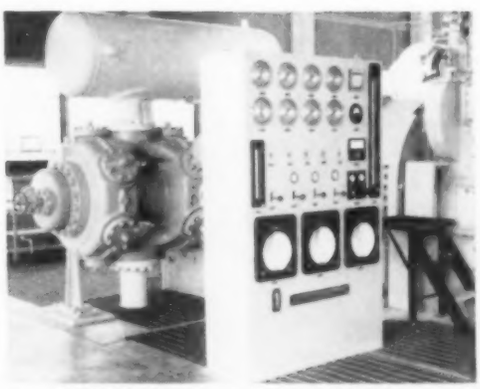
Typical installation of Control Valve for a Crude Oil Pumping Station.

Masoneilan Controls Demonstrate Dependability in Modern Pipeline Operation

Masoneilan Controls — instruments, control valves and auxiliary equipment — are demonstrating the dependable, low-maintenance service required for profitable pipeline operation. Remote station control, and other modern concepts designed to obtain operating simplicity and economy, demand this top dependability.

Versatility in application of standard Masoneilan products affords further opportunities for cost-saving. Extensive pipeline control experience enables Mason-Neilan engineers to exploit this versatility to your advantage.

For product data and application assistance, contact a Mason-Neilan representative, or write:



Masoneilan 60000 Series Instruments are used to control pressure at Compressor Stations for gas pipe lines.

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Fish Engineering Corp. May Build Gas Pipe Line From Sahara to France

A pipe line across the Mediterranean, to supply much needed gas to France is a step closer to reality—according to Fish Engineering Corporation.

Fish is negotiating with France's Ste. d-Etudes de Pipeline Intercontineutaux (SEPLI), a group of French transporters and industrialists, about the possibilities of laying a line from gas fields in the Sahara extending through Spain, to France and into West Germany.

Such a gas line from the Hassi R'Mel fields in central Algeria to northern France would be nearly 1,400 miles in length and probably from 30 to 40 inches in diameter. Costs are estimated from $500 to $750 million. Deliveries will be close to 1¼-billion cubic feet daily.

Fish International Corporation, a subsidiary of Fish Engineering, has proposed two different methods and two routes to make the Mediterranean submarine crossing at depths exceeding 1,500 feet. One plan calls for a 15-mile crossing at the Straits of Gibraltar; the other from Oran to near Cartegena in Spain, a distance of 100 to 115 miles.

Of the two routes mentioned the crossing at Cartegena would shorten the overall line by 300 miles. At Gibraltar, the depth is about 1,500 feet, whereas depths would reach 6,000 feet crossing at Cartegena.

Extreme pressures caused by the great depths of water and the unknown sea bottom contours have led engineers to investigate several methods other than conventional submarine stove-piping of steel pipe. Fish proposes to use a new flexible plastic pipe—steel re-enforced—which has been used offshore in the Gulf of Mexico. Presently this pipe is manufactured up to 4 inches in diameter, wound on reels and laid as continuous pipe requiring no welds. But for the Mediterranean project a bigger size pipe is needed. Although a diameter of at least 12 inches is necessary, engineers have not determined the exact size pipe that can be handled for the Mediterranean crossing. In order to lay the line in continuous form, Fish is considering taking the manufacturer to sea also. By modifying an old aircraft carrier to make a mobile pipe factory, the plastic pipe could be extruded at the "job site."

A second plan suggests an "inverted suspension bridge", anchored at the sea bottom, which would allow a steel pipe line to lay about 300 feet beneath the surface. This bridge would consist of vertical cables and horizontal guys connected to anchors.

Several other routes have been proposed to move gas through Sicily and Italy to France, and a more direct route across Sardinia and Corsica into southern France.

Collins Construction Company and Bechtel Corporation also are making studies on the possible Mediterranean crossing. Collins is dealing with Gaz de France, nationalized gas industry of France, and Bechtel is making a preliminary study on its own. Brown & Root, Inc., has also done a feasibility study on the project.

Other research is being done by French concerns and Constock International Methane on the possibilities of shipping the gas in tankers in liquid form. Constock has successfully transported liquid methane from the U. S. to Great Britain.

Mannix Co. Ltd. Constructing 80 Miles of Gathering Lines

Mannix Co. Ltd. is constructing 80 miles of 3- to 10-inch crude gathering lines for Pembina Pipe Line Ltd., and Federated Pipe Line Co., Ltd.

The Pembina work calls for 40 miles of 3- to 10-inch gathering lines and Federated is building 40 miles, 4- to 10-inch gathering lines in Virginia Hills, Judy Creek, and Sara Lake oil fields in Alberta.

Interstate Oil Pipe Line Co. To Build 15-Mile Crude Line

Contract has been awarded to Oklahoma Contracting Company to lay 15 miles of 10-inch crude line in Amite County, Miss., for Interstate Oil Pipe Line Company.

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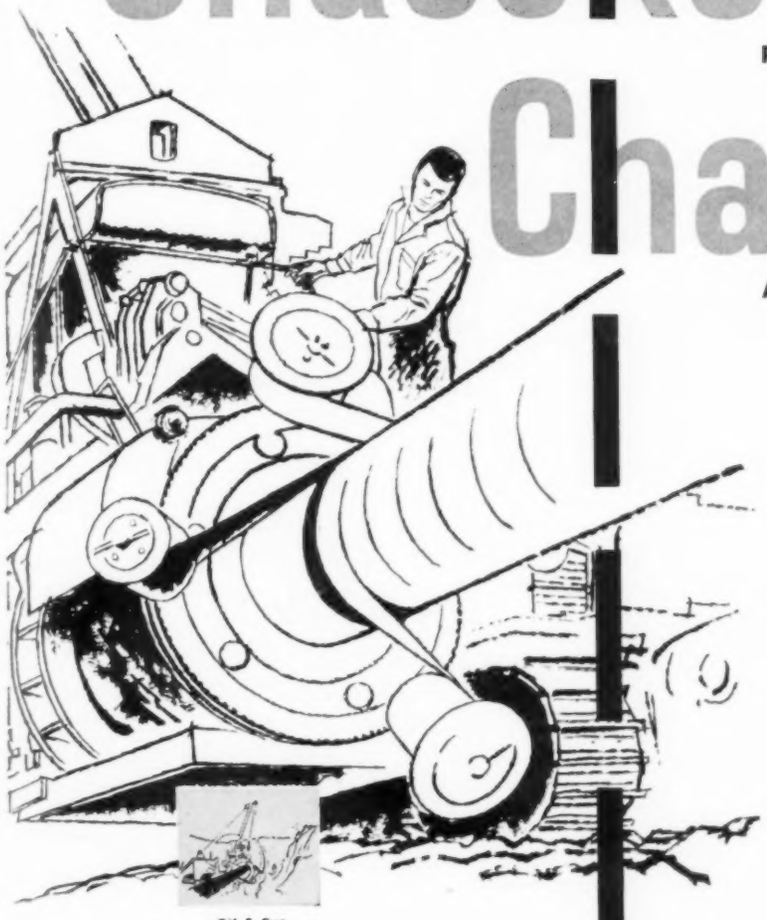

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Here's a brand new name for pipe protection! Chase & Sons, Inc., long-famous for protective and insulating tapes for electrical wire and cable, now introduces a new *corrosion prevention* package — the CORR-PREV Pipe Coating Team!

This new CORR-PREV Pipe Coating Team features *all* the time-proven advantages of polyethylene tape . . . *plus* a special extra heavy adhesive mass for a fast, permanent tape-to-metal bond . . . *plus* a tough, new, wrinkle-free overwrap for protection against backfill and soil stress damage.

Together, CHASEKOTE and CHASEWRAP give you the cleanest, quickest, easiest pipe-wrapping team at the *lowest applied cost*. This new corrosion control team from Chase & Sons, Inc., means added years of life to your underground piping. And it requires *far less* cathodic protection impressed current than comparative hotcoats!

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Please send me complete information about your new CORR-PREV Pipe Coating Team — CHASEKOTE and CHASEWRAP.

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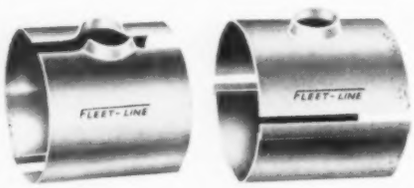

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Welding 8-Inch Lateral

Completing a 4-mile, 8-inch lateral near Thibodaux, La., Sam Carline Inc. welders apply stringer bead. The Transcontinental Gas Pipe Line Corporation lateral was laid off a barge in the marshy terrain. Actual pulling time took one week.

Southern Natural Project Receives FPC Authorization

The Federal Power Commission has authorized Southern Natural Gas Company's $52 million expansion program. Construction on the major portion of the 590-mile looping expansion have been let. (See PIPE LINE INDUSTRY, July, 1959, Page 75.)

The commission also approved South Georgia Natural Gas Company's proposal to construct facilities costing $1.9 million to increase service to 15 existing customers. Southern Natural also was given permission to construct facilities up to $3 million to be used to attach new supplies of gas during a 12-month period. With the approved facilities constructed, Southern Natural will boost its maximum delivery capacity from 990 Mmcf to 1.3 billion cubic feet daily.

Pan American International Building Argentina Line

Sharman, Allen, Gay & Taylor will construct an 84-mile, 14-inch crude line for Pan American International in Argentina from Comodoro Rivadavia field to the Atlantic Coast.

Initial capacity will be 12,600 barrels daily with ultimate capacity set at 50,000 barrels per day.

Mid-Continent Pipe Line Building Gathering System

Mid-Continent Pipe Line Company has awarded contracts for construction of 100 miles of crude gathering lines in northeast Cherokee, Mendon, West Mendon, Eureka, and north Roundhill fields.

Jess Whitlow Contractors will lay gathering lines in Alfalfa and Grant counties, Okla. A 36-mile, 6-inch main line will be built by A. C. Holder Construction Company. The additional lines will bring Mid-Continent's total mileage to over 3,000 miles of pipe lines.

Pacific Gas Transmission FPC Hearing Set Oct. 15

The FPC has scheduled the hearing on Pacific Gas Transmission Company's application for October 15. Pacific Gas proposes to build a $129 million 614-mile, 36-inch gas line from Kingsgate, B. C., to the vicinity of Klamath Falls, Ore.

Pacific Transmission plans to import 465 Mmcf of Canadian gas per day for delivery to its parent company, Pacific Gas & Electric Company. Pacific Transmission also proposes to transport 151 Mmcf per day which Pacific Northwest Pipeline Corporation will buy from Westcoast Transmission Company of Canada.

United Gas Awards Contract To Houston Contracting Co.

United Gas Pipe Line Company has awarded a contract to Houston Contracting Company to lay about 28 miles of 20-inch marsh and submarine lines and 2 miles of 12-inch. The 12-inch includes three crossings of the Mississippi River in Plaquemine Parish, La.

Westcoast Transmission Co. Plans 250-Mile, 30-Inch Line

Westcoast Transmission Company is planning a 250 mile, 30-inch gas line from Taylor, B. C., to Fort Nelson, B. C. The line will connect new discoveries in northern British Columbia to its transmission system.

Joint Venture Wyoming Crude Pipe Line Planned

A joint venture by seven oil companies has been planned to build a crude line in Wyoming. A 28-mile line from the Fourbear pool to the Oregon Basin Terminal of Platte Pipe Line Co. would be built by Honolulu Oil Co., Hunt Oil Co., Skelly Oil Co., Sinclair Oil & Gas Co., Husky Refining Company, Mule Creek Oil Company and Texaco, Inc.

An application has been filed with the Wyoming Public Service Commission. The line would cost $1.6 million.

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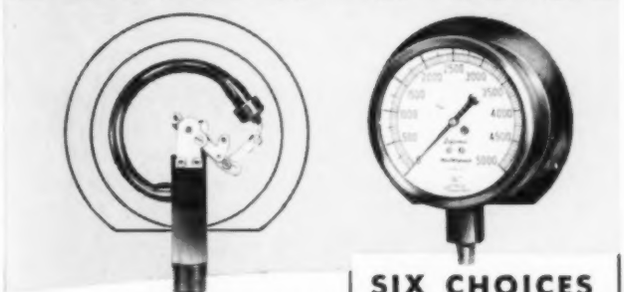

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4130 alloy steel tube with alloy steel tip and socket.

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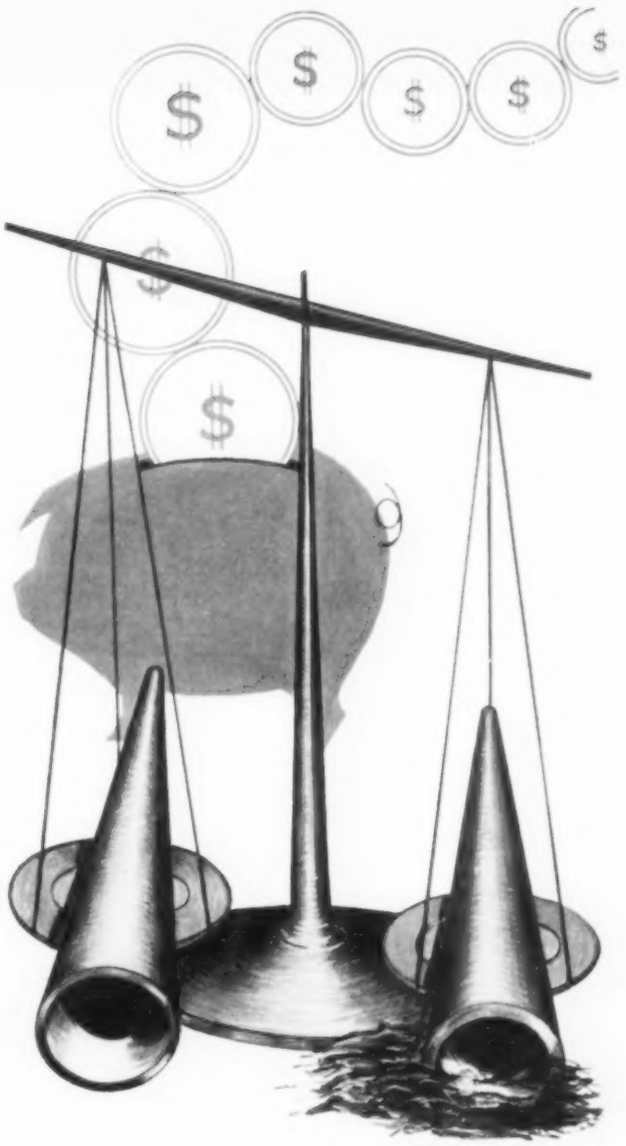

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Oklahoma Gas Pipe Line

Northern Oklahoma Gas Company's main line from Cherokee to Ponca City, Oklahome was completed last month. The firing gang is shown completing welding on O. R. Burden Construction Company's spread. The 70-mile, 12-inch line will serve Ponca City, Perry, Newkirk and industries in that area.

Transco Awards Contracts on $20 Million Expansion; Installing 60,280 Horsepower

Transcontinental Gas Pipe Line Corporation has let contracts on its compressor station expansion program which includes installation of 60,280 horsepower in 14 stations.

The $21 million project includes new stations at Greensburg, La.; Lexington, N. C.; Scottsville, Va.; and Delta, Pa. H. B. Zachary Co. will install 13,200 hp at Greensburg, Gasoline Plant Construction Corporation will construct the 7,640 hp Lexington station, Fish Engineering Corporation will build the 8,800 hp station at Scottsville, and Western Pipe Line, Inc., has contract for the 7,640 hp Delta station.

Contractors to install additional hp at several stations include: Fish Engineering Corporation, 2,500 hp at St. Francisville, La., 2,000 hp at Comer, Ga., and 2,500 hp near Linden, Ala.; Nichols Construction Company, 2,500 hp at Sandersville, Miss.; Dresser Engineering, 2,000 hp at Eunice, La.; A. R. Salley & Co., 2,500 hp near Stockbridge, Ga.; and Gasoline Plant Construction Corp., 2,500 hp near Moore, S. C., 2,000 hp at Reidsville, N. C., 2,500 hp near Appomattox, Va., and 2,000 hp near Orange, Va.

Construction on all stations except Greensburg will be under way this month; Greensburg work will begin in October.

Federal Power Commission Authorizes Several Projects

American Louisiana Pipe Line Company has been granted FPC temporary approval to construct an 8,000 horsepower compressor station in Louisiana, and a 10,000 hp station in Tennessee, at a cost of $6 million.

Mountain Fuel Supply Company received temporary authorization on 24 miles of 20-inch loop lines in Summit County, Utah, and Uintah County, Wyo.

Cities Service Gas Company has been given approval to construct 22.5 miles, 4- to 16-inch; 43 miles of 12- to 30-inch and 21 miles of 30-inch in Elk County, Kan.

Ohio Fuel Gas Company was granted permission to construct 28 miles of 6- to 12-inch line in Hancock, Wyandot, Wayne, Stark, Carroll, Columiana, Cochocton, Fairfield, Perry and Muskingum counties, Ohio. The projects include 9 miles, 24-inch in Seneca County.

Temporary authorization was given to United Fuel Gas Company for a $3 million project consisting of 5 miles of line and an 8,400 hp additions on its system.

Kansas-Nebraska Natural Gas Company's $1 million proposal was approved. Project includes 15 miles of 12-inch northeast of Phillipsburg and 2,800 hp to be installed in new and existing stations.

Western Slope Lets Contract On 106 Miles of Gas Lines

Contract has been awarded to A. J. Curtis & Co. for construction of 106 miles of 4-, 6-, and 8-inch gas lines for Western Slope Gas Company. The lines will be laid in the Grand Junction, Colo., area.

Saskatchewan Power Lets Contract on 24-Mile Line

Saskatchewan Power Corporation has let contract to Robb Construction Limited for construction of a 24-mile, 8-inch gas line from Wilkie to Unity, Saskatchewan.

At Unity, the line ties into an existing system to supply gas to the vicinity.

Mountain Fuel Lets Contract To Hood Construction Company

Mountain Fuel Supply Company has let contract to Hood Construction Company to lay a 24-mile, 20-inch gas line near Calville, Utah.

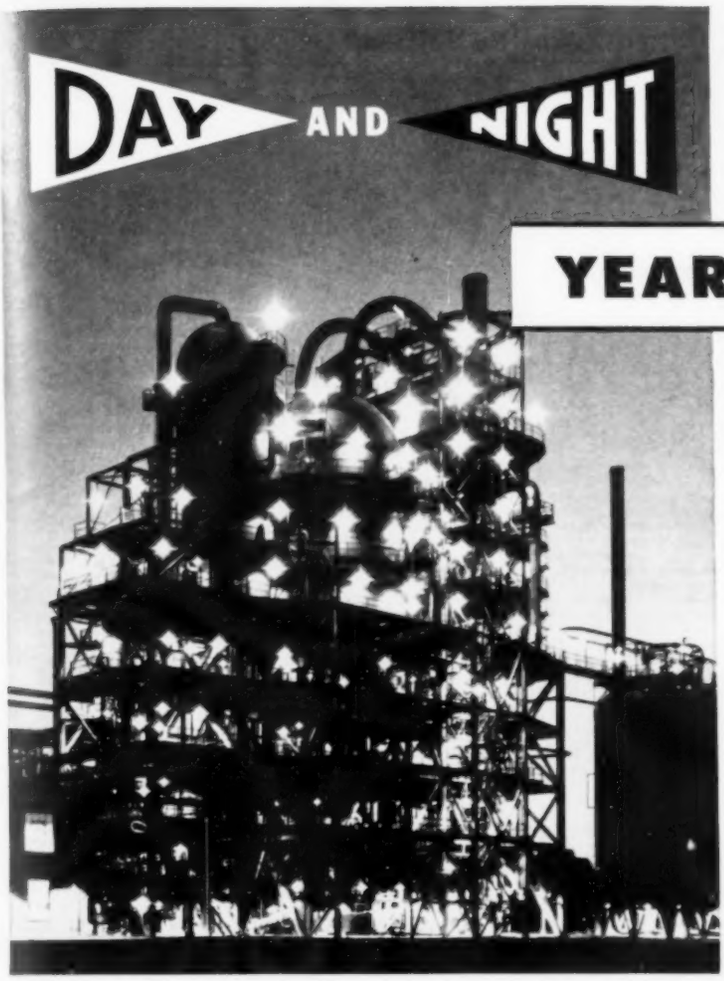
Texas Gas, Texas Eastern Receive FPC OK

Texas Gas Transmission Corporation received authorization from the FPC on its $40 million expansion program in Louisiana, Arkansas, Mississippi, Tennessee, Kentucky, Indiana and Ohio. Texas Gas will construct 165 miles of 30-inch, 81 miles, 26-inch, over 100 miles of supply lines, 14,000 additional horsepower and a 1,760 hp station and appurtenant facilities.

The FPC also authorized Texas Eastern Transmission Corporation to place in gas service about 189 miles of existing 20-inch line from Middleton, Ohio, to Moundsville, W. Va., 6,900 hp in existing compressor capacity and add 3,100 hp at existing stations.

Texas Gas and Texas Eastern will supply 100 Mmcf of gas daily to Hope Natural Gas Company. Texas Eastern will receive the gas from Texas Gas near Lebanon, Ohio.

Houston Contracting Company has been awarded a contract to lay 75 miles of 30-inch for Texas Gas and Western Pipe Line, Inc., will construct 175 miles of 26 and 30-inch.



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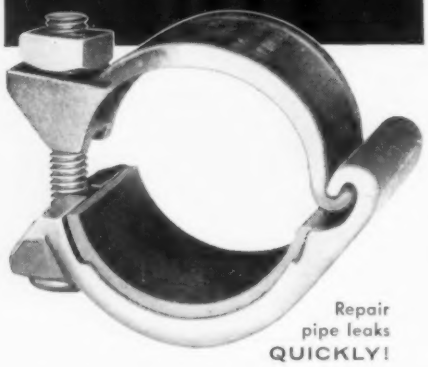

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PROPOSED PIPE LINE CONSTRUCTION

Here in convenient summary form is Pipe Line Industry's listing of company, line size, length, service, location and project status.

U. S.

Alaska Juneau Gold Mining Co., Los Angeles, 425 miles, 16-inch, gas, Oklahoma City area to St. Louis, planned.

Arkansas Industrial Pipeline Corp., Shreveport, 130 miles, 18-inch, gas, Perla-to-Helena, Ark., $9 million, planned.

Atlantic Seaboard Corp., Charleston, W. Va., 26-miles, 26 and 20-inch, gas, in West Virginia, Virginia and Maryland, contract let on 19 miles to H. L. Gentry Construction Co.

Cameron Crude Oil Corp., Tulsa, 30 miles, 8-inch, crude, Harper County, Okla., fields to Clark County, Kan., contract let to Monarch Constructors, Inc.

Carolina Pipeline Co., gas, main line, from near Aiken to Pontiac, S. C., $5 million, approved.

Coastal States Gas Producing Co., Corpus Christi, Texas, 289 miles, 14 and 18-inch main line and gathering system, McAllen to Falfurrias, Tex., area, and Lopena to La Salle County, $12 million, contract let on 200 miles to O. R. Burden Construction Corp.

60 miles, small diameter, gas gathering line, to tie in with system under construction and extend to Pearsall County, Texas, planned.

25 miles, gas, Associated Gas & Oil Co. field to South-Tex Corp., processing plant west of Corpus Christi, Texas, planned.

37 miles, gas gathering in Brown, Eastland, Comanche and Erath counties, Texas, planned.

Coastal Transmission Corp., Houston, compressor station additions and new lateral lines, $6.2 million, before FPC.

Colorado Interstate Gas Co., Colorado Springs, 140 miles, gas, Green River, Wyo.-to-Provo, Utah; 109 miles, 26-inch, Texas Panhandle to southeastern Colorado; 136 miles, 34-inch, southeastern Colorado-to-Pueblo, Colo.; 107 miles, 30-inch, Pueblo-to-Denver, $91 million, before FPC.

Colorado Oil & Gas Corp., Denver, 400-miles, gas, from Gubik field to Fairbanks, Alaska, planned.

Columbia Gulf Transmission Co., Houston, 12.8 miles, 6 and 20-inch, gas, loop line in Louisiana, $730,000, authorized.

41 miles, 24-inch, gas, loops, Lake Sand Junction to Arath Junction, La., before FPC.

East Coast Pipeline Co., 90 miles, 12 to 24-inch, products, Linden, N. J. to Suffolk County, N. Y., $25 million, planned.

El Paso Natural Gas Company, El Paso, 244 miles, 30-inch, Permian-San Juan loops, 108 miles, 20-inch, field feeder lines, before FPC.

69,240 hp in new and existing stations in Texas, Oklahoma, New Mexico and Utah, planned.

400 miles, 34-inch, Salt Lake City, Utah, to California border, before FPC.

Equitable Gas Company, Pittsburgh, Penn., 11.7 miles of storage pipe line and other facilities, $2,091,430, authorized.

12½-miles, 16-inch, paralleling existing system in Harrison and Marion counties, W. Va., authorized.

Florida Pipeline & Storage Co., 54 miles, products, Port Everglades to Homestead Air Force Base, Fla., planned.

Gillette Pipeline Co., Cheyenne, Wyo., 103 miles, crude, from Dead Horse Creek field to Casper, Wyo., planned.

Great Northern Railway, St. Paul, 400-600 miles, 12-20 inch, crude, from Williston Basin to St. Paul-Minneapolis and Duluth-Superior areas, considered.

Gulf Resources, New York, 125 miles, gas, gathering system, from Lopena area in Zapata County to a point in La Salle County, Texas, planned.

Hope Natural Gas Co., Clarksburg, W. Va., 45 miles, gas, from West Virginia to Pittsburgh area, planned, 20 miles, 24-inch, gas, in Wertzel and Monongalia counties, W. Va., authorized.

Humble Oil & Refining Company, Houston, 116 miles, gas, gathering various sizes, southwest Texas, contracts let on 57 miles to O. R. Burden Construction Corp. and H. B. Zachry Co.

Iron Ranges Natural Gas Co., 115 miles, gas, from Itasca and St. Louis counties along route of Mesabi range from Grand Rapids to Aurora, Minn., $5 million, FPC authorization.

60 miles from Duluth to Silver Bay, Minn., FPC authorization.

Katy and New York Central Railroads, 2500-mile, 10-12 inch, LPG, from Houston, Texas, to New York, considered.

Michigan Wisconsin Pipe Line Co., Detroit, 311 miles, gas, Marshfield to Appleton, Wis., 66 miles, Illinois, Indiana, and Michigan, 5,280 hp station at Marshfield, $24 million, planned.

Mid-Continent Pipe Line Company, Tulsa, 100 miles, crude, gathering, in Cherokee, Mendon, West Mendon, Eureka and north Roundhill fields, Oklahoma, contracts let to Jess Whitlow and A. C. Holder Construction Company.

Midwestern Gas Transmission Co., Houston.

504 miles, 24-inch, gas, from Minnesota-Canada border near Winnipeg to Marshfield, Wis., $52 million, before FPC.

continued on Page 96

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One company (name on request) saved approximately $365,000 in pipe alone by specifying and buying Southern Pipe LITE-WALL pipe. The job called for a 147-mile 6⅝" petroleum products line. By using LITE-WALL pipe, costs were cut by over ⅓.

Why always buy standard-weight pipe when you can now buy LITE-WALL pipe from factory stock. And, besides, it is good business to buy only the steel necessary to do the job.

Southern Pipe offers oil and gas pipe buyers LITE-WALL pipe to cut costs (Southern Pipe also produces line pipe in accordance with the American Petroleum Institute Specifications by means of its new high frequency welding process). Sizes range from 3½" to 14".

The chart below is a section taken from a more complete table found in Southern Pipe's informative LITE-WALL brochure.

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6⅝"	.1046	7.29	550	910	—
	.125	8.67	660	1100	—
	.1345	9.32	710	1190	—
	.156	10.82	820	1340	—
	.188	12.89	990	1680	1200

*Type C Construction for 5L Grade B according to Section 8, ASA B31.1.8 – 1955. F=0.5, E=1.0, T=1.0

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TRANSCONTINENTAL GAS PIPELINE COMPANY

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PROPOSED CONSTRUCTION

continued

Mountain Fuel Supply Co., Salt Lake City, 24 miles, 20-inch, loops in Utah 5 miles, 8-inch lateral, Utah, contract let to Hood Construction Company.

Natural Gas Pipeline Company, Chicago, 29 miles, 10-inch lateral, in Oklahoma, before FPC.

New York State Natural Gas Co., Pittsburgh, 30 miles, 20-inch, gas, main, Silver Springs to East Elma, N. Y., $1.6 million, authorization.

Northern Natural Gas Company, Omaha.

171 miles, main line extensions, 66 miles, main loops, 139 miles, branch lines, 6,000 hp additions, to extend system from Minneapolis to Duluth-Superior area, $25.7 million, contracts let on 315 miles to Williams Bros. Co. and R. H. Fulton & Co.

46 miles, main line extensions, 191 miles, loops, 1,767 miles, branch lines, and 45,400 additional hp, in Iowa, Minnesota, South Dakota, Nebraska, Wisconsin and Illinois, $76.7 million, FPC authorization.

37 miles, 30-inch, Bushton compressor station to Otis field, Kansas, 7,000 additional hp at Bushton, and development of underground storage facilities at Otis field, $20 million, before FPC.

Ohio Fuel Gas Co., 65 miles, gas, 4-24-inch main lines, in Belmont, Carroll, Cuyahoga, Fairfield, Logan, Lorain, Marion, Muskingum, Stark and Wayne counties, Ohio, $4.4 million, contract let on 42 miles to Shamrock Construction Co.

Pacific Gas & Electric Co., San Francisco, 296 miles, 36-inch, gas, from Klamath Falls, Ore., to Antioch, Calif., southern section of line from Canada to California, before California Public Utilities Commission.

131 miles, 34-inch, loops, Topock-Milpitas, before FPC.

42 miles, 30-inch, gas, Pittsburg to Irvington, Calif., planned.

Pacific Gas Transmission Co., San Francisco, 614 miles, 36-inch, Kingsgate B.C. to Klamath, Ore., northern section of Canada to California line, before FPC.

Pacific Lighting Gas Supply Co., 128-mile, 34-inch, gas, main line from Topock, Ariz. to Newberry, Calif., authorized.

Pacific Northwest Pipeline Corp., Salt Lake City, 235 miles gas, gathering lines in San Juan Basin, Garmesa, Piceance Creek, and Big Piney Fields, $13.5 million, planned.

65 miles, gas, sales laterals in Washington, $1.5 million, planned.

Pennsylvania Gas Co., Warren, Penn., 38 miles, 8 and 10 inch, gas, in Erie and Warren Counties, Penn., and Chautauqua County, N. Y., $2.6 million, authorized.

Permian Basin Pipeline Company, Omaha, 83 miles, 16-inch, gas, from Pioneer's proposed facilities to Spraberry, Texas, and 3,960 hp compressor station, $ million, before FPC.

P[ ]lmont Gas Co., Hickory, N. C., 78 [ ]les, 2-8 inch, gas, from connection [ ]th Transcontinental Gas Pipe Line to [ ]ve customers in North Carolina, $2.6 [ ]llion, authorized.

P[ ]cer Gathering System, Inc., Amarillo, [ ]exas, pipe line facilities in Texas cost[ ]g $3.7 million, before FPC.

Pi[ ]cer Natural Gas Co., Amarillo, Texas, [ ]2 miles, 10-inch main, Pampa, Texas, [ ] Canyon, in Randall County, Texas, [ ] miles, small diameter, gathering, [ ],000 h.p. stations, $4.5 million, planned.

Phillips Petroleum Co., 25 miles, 6 to 20-[ ]ch, gas, South Eunice, New Mexico [ ]rea, planned.

52 miles, 4 to 20-inch, gas, Gaines County, Texas, planned.

44-mile, 6-inch, products line, from Rocky pump stations to Amarillo, Texas, planned.

Rio Gas Gathering Co., San Antonio, 97 miles, 3 to 8-inch, gas gathering, South Texas, to supply gas to El Paso Natural Gas Company, planned.

Southern California and Southern Counties Gas Cos., Los Angeles, 200 miles, 34-inch, from Nevada-California border to point near Fullerton, Calif., $44 million, before Public Utilities Commission.

Southern Natural Gas Company, Birmingham, 490 miles, 16-24-inch, loop lines, gas, between Gwinville, Miss., and Wrens Ga; 62 miles, 14-inch, loops, along Atlanta-Macon line; 53 miles, 6⅝ to 14-inch, loops, along various branch lines. 3,140 additional hp at Gallion and Elmore, Ala. and Wrens, Ga. 60 miles, 20-inch, loops, in Louisiana between Franklington and White Castle and South of Toca. Lateral lines south of Gwinville and west to Cranfield field. 8,720 hp added at Franklinton, White Castle, Patterson and Brookhaven. contracts let on 355 miles to Sharman, Allen, Gay & Taylor; Oklahoma Contracting Co.; Harbert Construction Corp.; C. S. LeNoir Construction Co.; and Buchanan Contracting Co.

Tennessee Gas Pipeline Co., Houston, 21 miles, 16-inch, 2 miles, 12¾-inch, gas, Louisiana coast, Vermillion, Blocks 46 and 64, $2.9 million, before FPC.

158 miles, 36-inch, looping system in Louisiana and Mississippi, to supply Midwestern additional gas at Portland, Tenn., $61.4 million, authorized.

Texas Eastern Transmission Corp., Shreveport, La.

65 miles, gas, Delmont, Penn., to Lambertville, N. J., before FPC.

[ ]exas Electric Service Company, Fort Worth, 300 miles, gas, Old Ocean field to Fort Worth, Texas, $25 million, considered.

[ ]xas Gas Gathering Corp., Shreveport, 36.6 miles, gas, gathering system in Rodney Field, Jefferson County, Miss. and from North and South Locust Ridge, Lake St. John Field in Tensas and Concordia parishes, La., $855,413, before FPC.

[ ]exas Gas Transmission Corporation, 246 miles, 26-30-inch, loops, between Eunice, La., and Lebanon, Ohio, 102 miles, supply lines, south Louisiana, and

Continued on Page 98

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PROPOSED CONSTRUCTION

continued

addition of 15,760 hp, $40 million, contract let to Houston Contracting Co. and Western Pipe Line, Inc.

Texas Illinois Gas Pipeline Company, Chicago, 16,000 additional hp to stations at Lufkin, and Marshall, Texas; Texarkana, Malvern, Searcy, and Biggers, Ark.; Jackson, Mo.; and Hammond. Ill., $3.9 million, before FPC.

371 miles, 30-inch, loops, and 45 miles, laterals, gas, 6,700 hp station in Victoria County, Texas, $43.5 million, before FPC.

Transcontinental Gas Pipe Line Corp., Houston. 149 miles, 36-inch, main loops, 34 miles, 20, 24-inch gathering, compressor stations at Nueces County, Texas and St. Helena Parish, La., additional hp in eight stations, $51 million, before FPC.

60,280 hp in 14 compressor stations, $21 million, contracts let to Gasoline Plant Construction Corp., Fish Engineering Corp., H. B. Zachry Co., Western Pipe Line Inc., Nichols Construction Company, A. R. Salley & Co. and Dresser Engineering.

13 miles, 24-inch and 18 miles, 20-inch loops, Louisiana, FPC authorization. 14 miles, 16-inch laterals, 1-mile, 12-inch lateral, Louisiana, $2.1 million, FPC authorization.

Transwestern Pipeline Company, Houston, 1,305 miles, 24- and 30-inch, gas, main line, from West Texas and Oklahoma-Texas Panhandle area to Topock, Ariz., $193 million, FPC authorization.

Underground Storage & Exploration,

Upper Darby, Penn., 394 miles, 12-inch LPG, from Moundsville, W. Va. to Newark, N. J., $9 million, approved.

95 miles, 6-8 inch, laterals to Mauch Chunk, Penn., and to Philadelphia, planned.

Valley Gas Transmission, Inc., Houston, 160 miles, 3 to 8-inch, gas, gathering, in Hidalgo, Brooks, Starr and Jim Wells Counties, Texas, $15 million, before FPC.

Western Slope Gas Co., 106 miles, 6-8-inch, gas, Grand Junction, Colo., area, contract let to A. J. Curtis & Co.

Wilcox Crude Oil Corp., Shreveport, La., 20 miles, crude line in east central Louisiana, $500,000, planned.

International

ACT Oils, Ltd., Montreal, 400 miles, crude, Dawson Creek, B. C., to Bella Coola, B. C., before B. C. government.

Alaska-Yukon Refiners and Distributors, Ltd., Edmonton, Alta., 150 miles, products, serving Alaska and Yukon territory, $3.5 million, planned.

Alberta Natural Gas Company (Jointly owned by Westcoast Transmission Co. and Alberta & Southern Gas Co. Ltd.) 110 miles, 36-inch, gas, Alberta border to British Columbia-Idaho border, supply gas to Pacific Gas & Electric Co., $40 million, planned.

Arab League Oil Committee, large diameter crude line from Persian Gulf to Mediterranean Coast, $500 million, considered.

Aurine Alps Railway & Pipeline, 200 miles, crude, Venice to Munich, Germany, considered.

Bituminous Oil Pipeline Co., Calgary, 250 miles, crude, from Athabasca tar sand plant in northeastern Alberta to Edmonton, approved.

Burmah Oil Co., Ltd., 850 miles, crude, 20 inch, from Nahorkatiya to Calcutta, India, contracts let on 270 miles, 16-inch to Stewarts and Lloyds.

Cartier Gas Corp. (St. Maurice Gas, Inc., and Consumers Gas Co., Toronto), 170 miles, gas, Montreal to Quebec City, planned.

Consolidated Gathering Systems, Ltd., Calgary, 198 miles, crude, Sturgeon field to Edmonton, planned.

Creole Petroleum Co., 44 miles, 12-30-inch, gas, Bachaquero to Tia Juana, Venezuela, planned.

Development and Resources Corp., 70 miles, 8 inch, gas, from Agha Jari oil field to Ahwaz, Iran, planned.

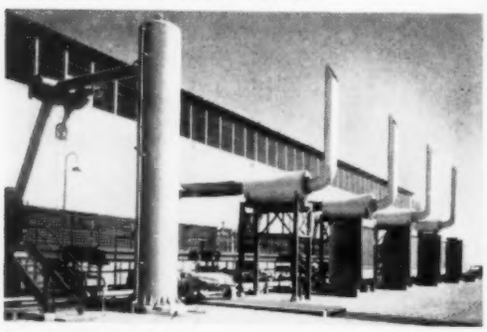
Entre Nazionali Idrocarburi, Rome, Italy, crude, from Qum field in Iran to the Mediterranean Sea, considered.

Federated Pipe Line Co. Ltd., 40 miles, 4-10-inch, crude, gathering, Virginia Hills, Judy Creek and Sara Lake Alberta fields, contract let to Mannix Co. Ltd.

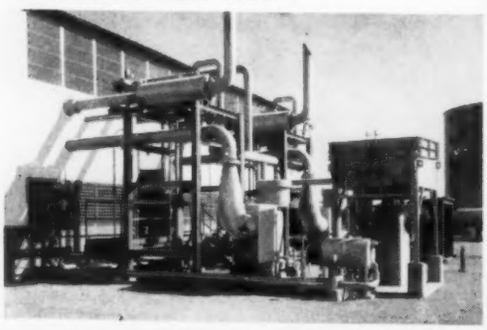
Foothills Pipe Line, Ltd., 500 miles, 12 to 16-inch, LPG, from Alberta to Pacific Coast, $80 million, considered.

Gibson Crude Oil Purchasing Co. Ltd. 170 miles, crude, Milligan Creek, B. C. to Grande Prairie, Alta., planned.

COMPRESSORS AND



GENERATORS ARE



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- ☐ Internal combustion exhaust and intake
- ☐ Air compressor intakes and discharges
- ☐ Blower intakes and discharges

name

company

address

Hydrocarbons Pipeline, Ltd., Winnipeg, Manitoba, 880 miles, 6-8 inch, products, from Edmonton to Winnipeg, $35 million, partial authorization.

Independent Pipe Line Co., 2,019 miles, 34-36-inch, crude, Edmonton to Montreal, 23,000 pump horsepower, $395 million, before Borden Commission.

Interprovincial Pipe Line Company, 350-mile extension from Toronto to Montreal, looping line from Edmonton to Toronto, crude, $240 million, considered.

6,150 hp pump station at Iron River, Mich., and 4,450 hp addition at Edmonton, Alta., $2 million, planned.

Iraq Petroleum Company, 80 miles, 30-32-inch, crude, loop line, Rumaila field to Fao, Iraq, planned.

Island Transmission Company Limited, Nanaimo, B.C., 25 miles, 10-inch, gas, from point near Vancouver, B.C. to Vancouver Island, 67 miles, 10-inch, laterals to Victoria and Nanaimo, B.C., $14 million, planned.

Mid-Continent Pipe Lines, Ltd., 1500-mile, 30-inch crude, Edmonton to Chicago, planned.

NATO, 211 miles, crude, 6-inch, between Malatya-Cetinkaya-Erzincan, Turkey, $6 million, bids asked.

National Iranian Oil Co., 146 miles, 6 inch, crude, from Azna to Isfahan, Iran. $5 million, planned.

1000 miles, 38 inch, crude, from central Iran to the Turkish Mediterranean coast, considered.

Pacific Petroleums Ltd., 213 miles, 3-8-inch, crude, gathering, Milligan Creek and Blueberry fields to Dawson Creek, planned.

Palestine Economic Corp., New York, 135 miles, 16-inch, crude, Eilat to Beersheba, Israel, to be completed July 1960.

Pan American International, 84 miles, 14-inch, crude, Comodoro Rivadavia field to Atlantic Coast in Argentina, contract let to Sharman, Allen, Gay & Taylor, Inc.

Peace River Oil Pipe Line Co., Ltd., 70-mile, crude, Swan Hills to Iosegun Junction, approved.

230 miles, 8-inch, crude gathering, from fields in northeast British Columbia to Dawson Creek, B. C., and Grande Prairie, Alta., and to existing lines at Sturgeon Lake, $8.5 million, planned.

Pembina Pipe Line, Ltd., Edmonton, 1,200 miles, LPG, from Alberta gas fields to eastern Canada, planned.

40 miles, 3-10-inch, crude, gathering, contract let to Mannix Co., Ltd.

Petroleos Mexicanos, 38 miles, 4 inch, products, from Mexico City to Toluca, $500,000 planned.

126 miles, 4, 6 and 8 inch, products, from Mexico City to Cuernavaca and Puebla, $2.5 million, planned.

214 miles, products, Monterrey to Torreon, $6.5 million, planned.

Pipelines of Puerto Rico, Inc., 95 miles, 8-inch, products, Penuelas to San Juan, Puerto Rico, planned.

Producers Pipelines Ltd., 25 miles, 4-inch, crude, Arlington Manor pool to Parkman pool, Saskatchewan, planned.

Rangeland Pipe Line Company Limited, 111 miles, 8-inch, crude, southeastern Alberta to Calgary, $3 million, planned.

Saskatchewan Power Corporation, 24 miles, 8-inch, gas, Wilkie to Unity, Saskatchewan, contract let to Robb Construction Limited.

Sociedad Nacional de Oleoductor, 75 miles, crude, from Santiago-to-Valparaiso, $3 million, planned.

Societa Nazionale Metanodotti, 250 miles, 18-inch, crude and products, Genoa to Milan-Cremona-Torino, Italy, and Geneva, Switzerland, considered.

Societe d'Etude du Pipe Line Sud-European, Paris, 419 miles, 30-inch, crude, port of Lavera to Strasbourg, with lateral extending 40 miles to Karlsruhe, Germany, approved by French cabinet.

Standard-Vacuum Oil Company, 60 miles, 8-inch, gas, main, in South Sumatra, considered.

Ste. d-Etudes de Pipeline Intercontinetaux, Paris, 1,400 miles, 30-40-inch, gas, from Hassi R'Mel field in central Algeria across Mediterranean, through Spain, France and into West Germany, considered, Fish International Corporation making engineering and feasibility studies.

Sui Gas Transmission Co., Multan, Punjab, India, 145 miles, 8-inch, gas, from Sylhet to Dacca, East Pakistan, $9 million, considered.

130 miles, 16-inch, gas, main line, Multan to Lyallpur, planned.

Trans-Canada Pipe Lines Limited, Toronto, compressor stations at Ignace, Geraldton and Hearst, Northern Ontario, and Maple, north of Toronto, $15.5 million, planned.

Trans-Prairie Pipelines, Ltd., Edmonton, crude line, from Weyburn field to Regina-Moose Jaw areas, $5 million, considered.

Crude line from Milligan Creek area to Dawson Creek and Fort St. John refineries, planned.

Union Gas Company of Canada Limited, 45 miles, 8-inch, gas, main, Stratford to Goderich, Ontario; 10-miles, 8-inch, main, to Amhertburg; 10-miles, 12-inch, lateral, Galt to Brantford, planned.

Westcoast Transmission Company, Ltd., 174 miles, 30-inch, gas, Savanna Creek gas field, Alberta, to British Columbian border, $45 million, planned.

250 miles, 30-inch, gas, Taylor to Fort Nelson, B.C., planned.

Williams-McWilliams Industries, Inc., New York, 441 miles, 6-inch, crude, Villa Montes, Bolivia to Villa Hayes, Paraguay, considered.

Yacimientos Petroliferos Fiscales, Buenos Aires, Argentina, 621 miles, 12-inch, products, Mendoza to San Lorenzo, Argentina, $19 million, planned.

281 miles, 12¾ inch, crude, Pichanal to San Miguel Tucuman to Techint, S. A., planned.

450 miles, 16-inch, crude, from Neuquen Province to Bahia Blanca, planned

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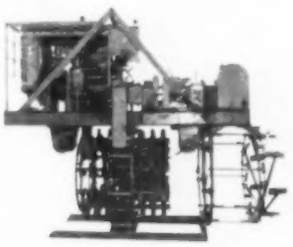

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Right of Way Contract Let To Ford, Bacon & Davis Co.

Ford, Bacon & Davis has been awarded contract for design and right of way studies on Texas Electric Service Company's 290-mile, gas line from Old Ocean field to Fort Worth, Texas.

The 22- or 24-inch, $20 million pipe line will be completed by 1961.

Construction Underway On Florida's Jet Fuel Line

Construction is underway on Florida Pipeline and Storage Company's 54-mile, 8-inch jet fuel line project from Port Everglades to Homestead Air Force Base. Two 55,000 barrel fuel tanks are being constructed by Chicago Bridge & Iron. The $2 million pipe line will be under construction soon.

Tennessee Gas Transmission To Acquire Pipe Line Co.

Tennessee Gas Transmission Company plans to acquire all outstanding stock of East Tennessee Gas Company. Board of directors of the latter have approved the move. East Tennessee operates over 700 miles of pipe line.

TGT have offered to exchange one share of its stock for 2¾ shares of East Tennessee stock.

Coastal States to Construct 25-Mile Gas Line in Texas

Coastal States Gas Producing Company will build a 25-mile line from the Associated Oil & Gas Company field in South Texas to the South-Tex Corporation gas processing plant west of Corpus Christi. The line will have a daily capacity of 100 Mmcf of gas. The agreement calls for dedication of 800 billion cubic feet of gas to Coastal. The company will deliver it to a transmission customer.

Coastal also is planning a 37-mile gathering line in conjunction with Lone Star Gas Company. Lone Star will advance Coastal $15,000 per well toward development of 50 wells in Brown, Eastland, Comanche, and Erath counties in Texas. A 20-year contract for gas deliveries to Lone Star will begin in 1960.

Southern Counties Begins Work on 14-Mile Gas Line

Southern Counties Gas Company awarded a contract to Engineers, Pipeline Company for construction of a 14-mile, 24-inch gas line from near Moreno in Riverside County to a point in Perris-Winchester area in California.

The loop will complete paralleling a 35-mile section of existing lines in Riverside county. When completed, the line will enable Southern Counties to deliver 142 Mmcf of gas per day to the San Diego Gas & Electric Company. Completion of the $1.2 million job is expected before November.

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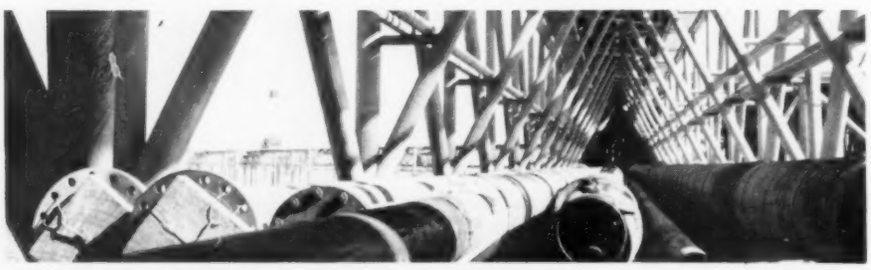

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What's Happening

among MEN in the INDUSTRY

Transwestern Pipeline Company announces the appointment of **N. C. Turner** as vice president in charge of engineering and operations.

N. C. Turner

Turner has been vice president of the Hudson Engineering Corporation, where he has been employed for the past 12 years. Turner spent two years in Russia working for the government in the early 1930's on plans for natural gas and light hydrocarbon facilities.

At Hudson, Turner has supervised engineering on numerous projects in the natural gas and petrochemical industry in the United States, South America and Middle East. He also worked on a gas purification plant and metering and regulation facilities for Sui Gas Transmission Company.

Service Pipe Line Company announces the appointment of **J. J. Wright** as superintendent of the Williston, N.D., district. **Lowel E. Anderson**, division chief engineer of Wyoming division, has been assigned temporarily to **Pan-American International Oil Co.** for foreign service.

Wright replaces **A. S. Munneke**, district superintendent since 1954, who has been transferred to Tulsa general headquarters. **Robert H. Christman**, former section head in Tulsa engineering department, succeeds Anderson. **J. W. Cox** will replace Wright as superintendent of Service's Drumright district.

Earle A. Clark and **Randall T. Klemme** have been elected vice presidents of **Northern Natural Gas Company.** Clark, director of public relations prior to his promotion, directs Northern's public relations, advertising and promotion activities. He has been with the company for 9 years.

Klemme, who joined Northern in 1958, will direct the marketing, area development, research and customer relations activities for Northern. Northern also named **H. M. Sampson** assistant vice president. He has been with the company 8 years and was director of customer relations.

The board of directors of **Cities Service Company** announces election of **W. Alton Jones** as chairman of executive committee and **Burl S. Watson** as chairman of the board and chief executive officer succeeding Jones.

J. Ed Warren was named president succeeding Watson. Three senior vice presidents elected include **A. P. Frame, Charles S. Mitchell** and **George H. Hill, Jr. Erle G. Christian**, formerly secretary, and **Edward L. Stauffacher**, formerly president of the company's subsidiary, **Cities Service Oil Co.**, were named vice presidents and elected to the board. **Frank K. Foster** succeeds Christian as secretary.

Jones served as president and chief executive officer with Cities Service from 1940 until 1953 when he was named board chairman. Watson, who joined the organization in 1917, replaced Jones as president in 1953. In 1958 Warren joined Cities Service.

E. C. Bovey has been named vice president and **A. Hove** vice president and chief engineer for **Northern Ontario Natural Gas Company Limited.**

Hove joined the company in 1958 as chief engineer. He will direct activities of the engineering and operations department. Bovey, who joined the firm in 1958 as assistant to the president, will supervise activities of the Financial Departments, Personnel, Public Relations, Rates, Purchasing and Industrial Developments and Research Division.

Coastal Transmission Corporation has appointed **Gerald L. Mardis** pipe line superintendent replacing **S. L. Windham.** Windham recently was named general pipe line superintendent for Coastal and **Houston Texas Gas & Oil Corporation.**

Mardis has been district pipe line superintendent at Refugio, Texas before joining Coastal. Previously he had been with Wilcox Trend Gathering System and Tennessee Gas Transmission Co.

R. H. Hord, formerly manager of personnel and industrial relations at **Shell Oil Company's** Wood River, Ill., refinery, has been named manager of same department for **Shell Pipe Line Corporation** in Houston.

R. H. Hord

Hord succeeds **R. A. Pratt**, who becomes administrative superintendent of Shell's Norco, La., refinery. **A. J. Martin** succeeds Hord at Wood River. Martin presently is a representative in Shell's head office industrial relations department. Other Shell changes include **W. B. Golush**, formerly manager of head office gas department, now general gas manager Shell Oil Company. **J. T. Jordan**, formerly manager of head office technology department, has been named manager gas engineering and **M. L. Newmaster**, formerly superintendent of Shell's TXL gasoline plant in West Texas, will serve as senior gas engineer in a gas utilization group. This group coordinates economic utilization and disposition of natural gas.

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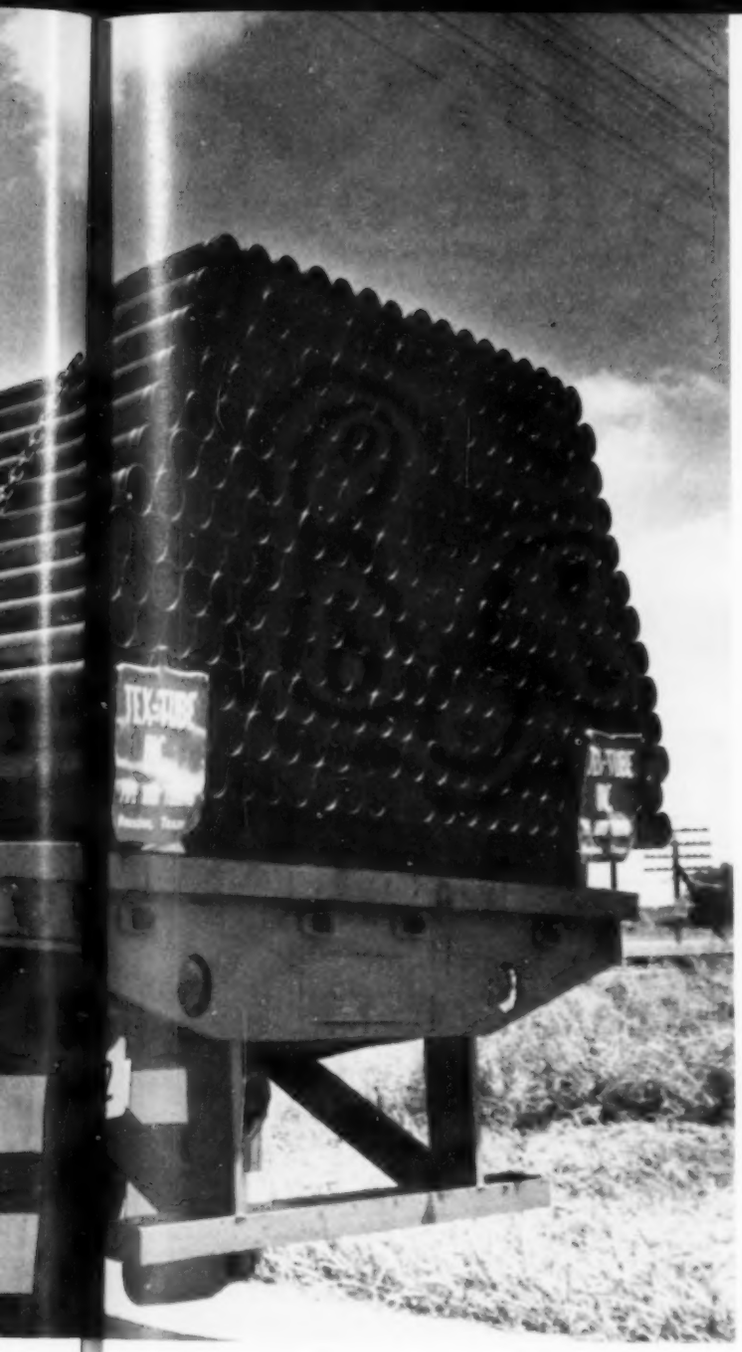

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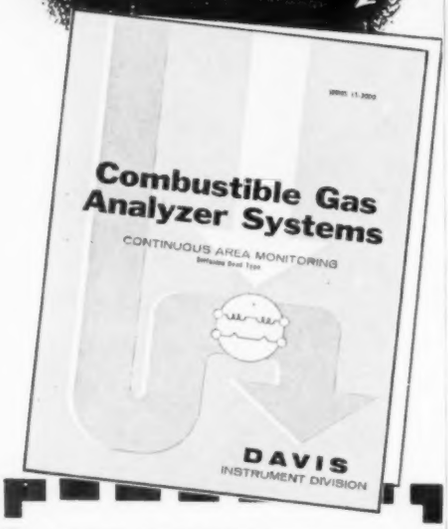

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Cities Service Gas Company announces the election of **Burton F. Wiand** as vice president in charge of Public and Industrial Relations Division. He has been with the company since 1952 as manager of the Public and Industrial Relations Division. In 1956 he was named a director.

B. F. Wiand

Prior to joining Cities Service, Wiand was appointed a special agent in the Federal Bureau of Investigation from 1939 to 1946. He then became counsel for the Reconstruction Finance Corporation and later was appointed director of Compliance, War Assets Administration.

Nominations for offices in the American Gas Association have been announced. **Wister H. Ligon**, president and director of **Nashville Gas Company** has been nominated for presidency. Other candidates include **L. T. Potter**, president, **Lone Star Gas Company**, first vice president; **E. H. Smoker**, president, **The United Gas Improvement Co.**, second vice president; and **Vincent T. Miles**, treasurer, **Long Island Lighting Co.**, has been renominated for treasurer.

Also nominated were 15 directors, in addition to 10 chairmen and vice chairmen of the association's Accounting, General Management, Industrial and Commercial Gas, Operating and Residential Gas sections. Elections will be held at the national gas industry annual convention October 7 in Chicago.

C. Milton Allen, controller and assistant secretary of **Trunkline Gas Company** has been elected vice president of the Houston Control of the Controllers Institute of America. **James T. Noel**, assistant controller of **Panhandle Eastern Pipe Line Company**, has been named vice president of Kansas City Control.

George E. Pierce, controller, **Buckeye Pipe Line Company** is vice president of Long Island Control. **Douglas G. Simpson**, controller of **Trans-Canada Pipe Lines Limited** is a director of Toronto Control.

Transcontinental Gas Pipe Line Corporation announces the appointment of **Arthur E. Bryan** and **Gladys M. Jurchak** as assistant corporate secretaries.

As assistant treasurer, Bryan is an officer of the corporation. Miss Jurchak, since 1950, has been executive secretary to **Tom H. Wheat**, Transco corporation secretary.

Colorado Oil and Gas Corporation announces the appointment of **Clyde E. Milligan**, general counsel for the Corporation Commission of Kansas, as attorney. Milligan's assignment will include legal representation of **Derby Refining Company** and **Jayhawk Pipeline Corporation**, affiliates of Colorado Oil and Gas Corp.

Richard S. Barfield has been named manager of European operations with offices in the Hague, The Netherlands, for **Pipe Line Technologists, Inc.** Barfield joined the firm in 1957 and recently was project engineer on a Kansas pipe line system. Before coming to Pipe Line Technologists he had been associated with Gulf Refining Company's pipe line division in Houston for 7 years.

Ellsworth G. Reynolds has been named a vice president of **Michigan Consolidated Gas Company.** Reynolds joined Michigan Consolidated in 1948 as legal and administrative assistant to the secretary. He was appointed assistant secretary in 1952 and secretary in 1953.

J. H. Foote, chief engineer of **Commonwealth Associates**, and vice president and director of engineering for **Commonwealth Services Inc.**, has been elected president of the **American Institute of Electrical Engineers** for 1959-1960. Foote was a vice president of the association in 1958.

Mack Atcheson has been promoted to assistant operating manager of **El Paso Natural Gas Products Company.** Atcheson joined El Paso Natural Gas Company in 1949 and became associated with the products company in 1956. He was chief engineer prior to his recent promotion.

Mack Atcheson

Virgil A. Johnson succeeds Atcheson as chief engineer. He has been with the company since 1957; he was named assistant chief engineer in 1958.

Colorado Interstate Gas Company announces several organizational changes in its Engineering Department. Four functional sections of the Engineering Department have been established under direct supervision of Vice President **Thomas L. Pelican.** The sections include drafting, economics, service and projects.

D. D. Sherrill will head the drafting department and will be responsible for preparation of drawings, maps, material requisitions, engineering standards and all related files on such work. Chief Industrial Engineer **P. A. Dieffenbach** will be in charge of the economics section. He will be in charge of feasibility studies, regulatory applications and engineering aspects of regulatory matters generally, market surveys, statistical reports and other special assignments. As head of service section **B. P. Schaberg** is responsible for engineering and technical service, assistance to operating departments and the maintenance of a close contact with operations. Project section supervisor will be Chief Project Engineer **R. R. Olson.** He will be responsible for basic engineering design and specifications for all new construction work.

Charles C. Marietta has been appointed a special representative for **Pipe Line Technologists, Inc.,** in Mexico. Marietta has been in the design engineering for oil and gas industry in the United States and Latin America for the past 32 years. He had been with Venezuelan Atlantic Refining Co. the past 10 years. He began his career with Venezuela Gulf in 1927.

WHO'S MEETING WHERE

September

Pacific Coast Gas Association, annual meeting, Ambassador Hotel, Los Angeles, Sept. 9-11.

School of Pipe Line Technology, sponsored by API Division of Transportation and University of Texas Petroleum Extension Service, Lee College, Baytown, Texas, Sept. 14-Oct. 23.

NGAA, Rocky Mountain Regional meeting, Wyoming-Gladstone Hotel, Casper, Wyo., Sept. 17.

ASME, petroleum mechanical engineering conference, Rice Hotel, Houston, September 20-23.

ISA, 14th annual instrument-automation conference and exhibit, International Amphitheatre, Chicago, Sept. 21-25.

Institute of Radio Engineers, 1959 National Symposium on Telemetering, Civic Auditorium, San Francisco, Sept. 28-30.

American Welding Society, fall meeting, Sheraton-Cadillac Hotel, Detroit, Sept. 28-Oct. 1.

NACE, western region conference, Bakersfield Inn, Bakersfield, Calif., Sept. 29-Oct. 1.

October

NACE, southeast region, Robert Meyer Hotel, Jacksonville, Fla., Oct. 1-2.

Institute of Radio Engineers, fifth national communication symposium, Hotel Utica, Utica, N. Y., Oct. 5-7.

AGA, 41st annual convention, Conrad Hilton Hotel, Chicago, Oct. 5-7.

NACE, northeast region, Lord Baltimore Hotel, Baltimore, Md., Oct. 5-8.

California Natural Gasoline Association, fall meeting, Huntington-Sheraton Hotel, Pasadena, Calif., Oct. 8-9.

National Electronics Conference, sponsored by Illinois Institute of Technology, two societies and two universities, Hotel Sherman, Chicago, Oct. 12-14.

NACE, south central region, Cosmopolitan Hotel, Denver, Oct. 12-15.

Gas Measurement Institute, National Guard Armory, Liberal, Kan., Oct. 13-14.

ASCE, pipe line division, annual meeting, Statler-Hilton Hotel, Washington, D. C., Oct. 19-21.

NACE, north central region, Statler-Hilton Hotel, Cleveland, Oct. 20-22.

ASME, ASLE, lubrication conference, Hotel Sheraton-McAlpin, New York City, October 20-22.

NGAA, southern regional meeting, Carlton Hotel, Tyler, Texas, Oct. 23.

NGAA, annual meeting, Westward Ho Hotel, Phoenix, Ariz., Oct. 26-27.

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Six Annual Computer Applications Symposium, Morrison Hotel, Chicago, Oct. 28-29.

November

API, 39th annual meeting, Conrad Hilton, Palmer House and Congress Hotels, Chicago, Nov. 9-11.

Fifth International Automation Exposition, New York Trade Show Building, New York, November 16-20.

ISA, Philadelphia section, symposium, Ben Franklin Hotel, Philadelphia, Nov. 23-24.

ASME, annual meeting, Chalfonte Haddon Hall, Atlantic City, Nov. 29-Dec. 4.

ON THE LINE

NACE Pipe Line Papers

Several papers devoted to pipe line corrosion topics will be given at NACE regional meetings in September and October.

The NACE Western Region meeting at Bakersfield, Calif., September 29 to October 1, will include three papers on pipe line corrosion.

At the NACE South Central Region meeting in Denver October 12-16, eight papers on oil and gas production and pipe line corrosion will be presented.

There will be several papers presented at NACE October meetings on coatings. At the Northeast Region conference in Baltimore, October 5-8, there will be six papers devoted to coatings. Two papers are scheduled for the Western Region at Bakersfield and a symposium on protective coatings will be held at the North Central Region meeting in Cleveland, October 20-22.

The NACE Shreveport section will hold its annual short course for oil and gas personnel September 22 and 23 at Centenary College. "How To Do It" is the theme for this year's course to be directed by Ned C. Stearns, general chairman for 1959. Emphasis will be on basic fundamentals and practical approach to corrosion control.

AGA Pipe Line Research Report

The American Gas Association will report progress in nine areas of pipe line research at its second annual Pipeline Research Forum at the Statler Hilton Hotel, Dallas, September 17.

Kirby E. Crenshaw, president, Cities Service Gas Company, and Dr. Frank H. Dotterweich, professor of gas engineering at Texas College of Arts & Industries, will be guest speakers. Kirby will voice his views on the gas industry's future; Dotterweich will speak on the role of education and research in the industry.

Reports will include latest advances in flow equation research, internal pipe coating, branch connections, secondary stress, line pipe research, noise abatement, underground storage, pulsating flow measurement and prediction of compressor engine wear.

Chairman of the AGA Pipeline Research Committee is John F. Eichelmann, vice president and executive engineer with El Paso Natural Gas Company.

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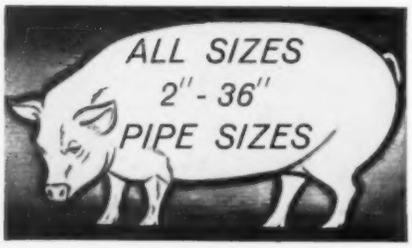

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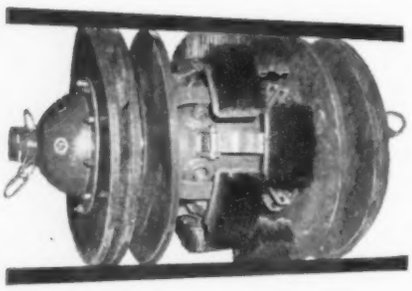

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Council says 28 new ideas are needed by the military.

In its report "Supplement to Technical Problems Affecting National Defense," the council lists these problems along with five revised problems. Inventors interested should write the National Inventors Council, U.S. Department of Commerce, Washington 25, D. C.

Clearinghouse for Translations

The U.S. Department of Commerce's "clearinghouse" for tranlations of technical-scientific literature reports that 4,055 complete translations and 35,000 abstracts of foreign technical literature, mostly Russian, have been made available to the public.

The Office of Technical Services opened its "clearinghouse" July, 1958, to distribute translations done by government agencies for their own use; presently some 700 new titles are added to the collection monthly. Prior to establishment of the clearinghouse, there was no means of releasing this material to the public.

The OTS, in cooperation with Special Libraries Association, in January began publishing a bi-weekly journal as a central source of information on new translations available to science and industry. The Technical Translation journal lists and abstracts translations done by private organizations as well. The OTS also publishes Scientific Information Report, a semimonthly publication produced by translators at Central Intelligence Agency. For information write OTS, U.S. Department of Commerce, Washington, D. C.

Tidewater-Skelly May Merge

Tidewater Oil Company and Skelly Oil Company are discussing plans for a merger. The merger would unite all phases of the integrated oil companies foreign and domestic operations.

Skelly and Tidewater have had several committees on marketing, manufacturing, land and reserves, transportation and accounting working with technical experts and appraisers to evaluate assets of companies' operations.

Use of Tidewater's computers will aid the companies considerably in evaluating and comparing leases and oil reserves.

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What's Happening among SERVICE and SUPPLY MEN

Barge Terminal at Pipe Coating Yard

Syd E. Culbertson Co., Inc.'s recently completed barge terminal on the Buffalo Bayou in Houston makes possible additional transportation facilities to and from the pipe coating and wrapping plant seen in the background. The project was completed in cooperation with the United States Corps of Engineers. Pipe can be transported by rain, barge or trucks from the yard.

Shand and Jurs Company Names Peter C. Jurs President

Peter C. Jurs, an executive officer with Shand and Jurs Company for 22 years, was elected president of the company. He succeeds R. M. Young as chief executive officer. Prior to his appointment he had been executive vice president.

Peter C. Jurs

Other appointments announced by Shand and Jurs include the promotion of Rex W. Milton as manager of Houston's sales office and Bill W. Mayer becomes assistant Houston manager.

Milton succeeds Joe M. Greenlee. Mayer previously was in sales and engineering at the company's Berkeley, Calif., headquarters.

Robert G. LeTourneau Selected To Receive Transportation Award

Robert G. LeTourneau has been selected by the military's Joint Chief of Staff to receive the 1959 National Defense Transportation Association Award.

LeTourneau will be presented the award October 14 at the association's annual banquet to be held at Olympia Hotel in Seattle.

The R. G. LeTourneau, Inc., executive was cited as the person "whose achievements contributed most to the effectiveness of transportation industry in support of national security."

Lindsay, LaRue Promoted in Crane Co.'s Sales Department

W. D. LaRue, district manager of Crane Co.'s mountain states area, has been promoted to the post of general manager of wholesaler sales. Ronald W. Lindsay has been appointed to the newly-created position of director of sales for the company.

Lindsay joined the firm in 1947, became manager of Crane's northeastern sales district in 1958 and was named manager of wholesaler sales this year. LaRue has been district manager with offices at Denver. He has been with the company since 1926. In 1938 he became manager of Muncie, Ind., district and in 1945 was appointed manager at Toledo, Ohio. He was named manager Crane branch at Cincinnati in 1954.

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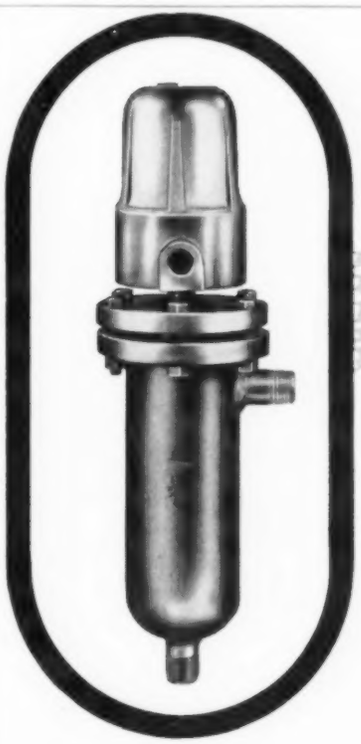

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Youngstown Sheet & Tube Company Appoints Four at Indiana Harbor

Youngstown Sheet & Tube Company announces the appointment of four superintendents at the Indiana Harbor works. Clyde M. Horan has been named general superintendent of basic steel operations at both Indiana Harbor and South Chicago works. Donald M. Lloyd is general superintendent of steel plant rolling and finishing mills and Robert M. McCafferty has been promoted to superintendent of continuous butt weld tube mills. Charles W. White, Jr., was named superintendent of bloom, billet, bar and skelp mills at Indiana Harbor.

Horan joined the company 30 years ago as a practice engineer at the Campbell works blast furnaces and later was assistant superintendent of blast furnaces. In 1956 he was appointed general superintendent, steel plant operations at Indiana. Lloyd started with the company in 1936 at Campbell works rolling mills. He was made superintendent of continuous butt weld tube mill at Indiana in 1953. McCafferty joined the company in 1955 and in 1958 was named assistant superintendent of maintenance in tube mills. White has been with Youngstown since 1955.

United States Steel Corporation Announces Several Appointments

R. C. Craig has been appointed district manager at Denver for U.S. Steel's Oil Well Supply Division. Charles T. Lathrop, Jr., has been named district engineer—machinery and equipment sales & service, New Orleans, and Lail Hamilton Shaw was made assistant district engineer in Houston for the Gulf Coast area.

Craig joined the company in 1945 and has been assistant district manager since June 1956. Shaw came to U.S. Steel in 1957 and in 1958 was appointed district engineer at Farmington, N.M. Joining U.S. Steel in 1956, Lathrop was appointed assistant district engineer in Houston in 1957.

Crosby Valve and Gage Co. Names William E. Mikolasy Sales Manager

William E. Mikolasy has been made sales manager, Eastern Districts, for Crosby Valve and Gage Company. Mikolasy, formerly assistant vice president sales for Walworth Company, will serve in a supervisory capacity coordinating sales and services in Eastern and Midwestern districts.

Clear Span Sales Co. Names Marvin L. DeWoody President

Marvin L. DeWoody

Clear Span Sales Co. announces the election of Marvin L. DeWoody as president.

The sales company is an affiliate of Clear Span Engineering, Inc., which designs and builds aerial crossings for pipe lines. Weldon F. Appelt is president of the engineering firm.

Air Preheater Corp. Announces Additional Plant Facilities

An additional plant at Wellsville, N.Y., is being constructed by Air Preheater Corporation. The 40-foot high building will have 32,000 square feet of floor area. It is being built in an 80- by 400-foot area between the company's plants 2 and 3.

Allis-Chalmers Acquires Tractomotive Corporation

Allis-Chalmers Manufacturing Company has acquired the Tractomotive Corporation which makes 21 plants in the Allis-Chalmers group and will be operated at the Deerfield Works. John W. Carlson, president of Tractomotive, has been named general manager of the Deerfield, Ill., Works. The plant will complement production at Allis-Chalmers Springfield, Ill., and Cedar Rapids, Iowa, plants. The plant manufactures the Tracto-Loader, front-end shovels, rippers, sidebooms and log loading equipment for crawler tractors.

Allis-Chalmers Manufacturing Co. Names Saar Assistant Vice President

George A. Saar has been appointed assistant vice president of the Industry Group for Allis-Chalmers Manufacturing Company.

Saar had been manager of Electrical Department at the Norwood Works for the past four years. Previously he had been works comptroller at Norwood, Ohio. Saar started with Allis-Chalmers in 1936 and in 1942 he became assistant works accountant at West Allis.

Two District Appointments Announced by Walworth Company

Walworth Company announces the promotion of Dee Hammond to manager of Los Angeles Division and Joseph G. Younggren was named assistant division manager of the firm's Gulf Division.

Hammond had been assistant division manager of the Gulf Division. Younggren has been with the company for 17 years.

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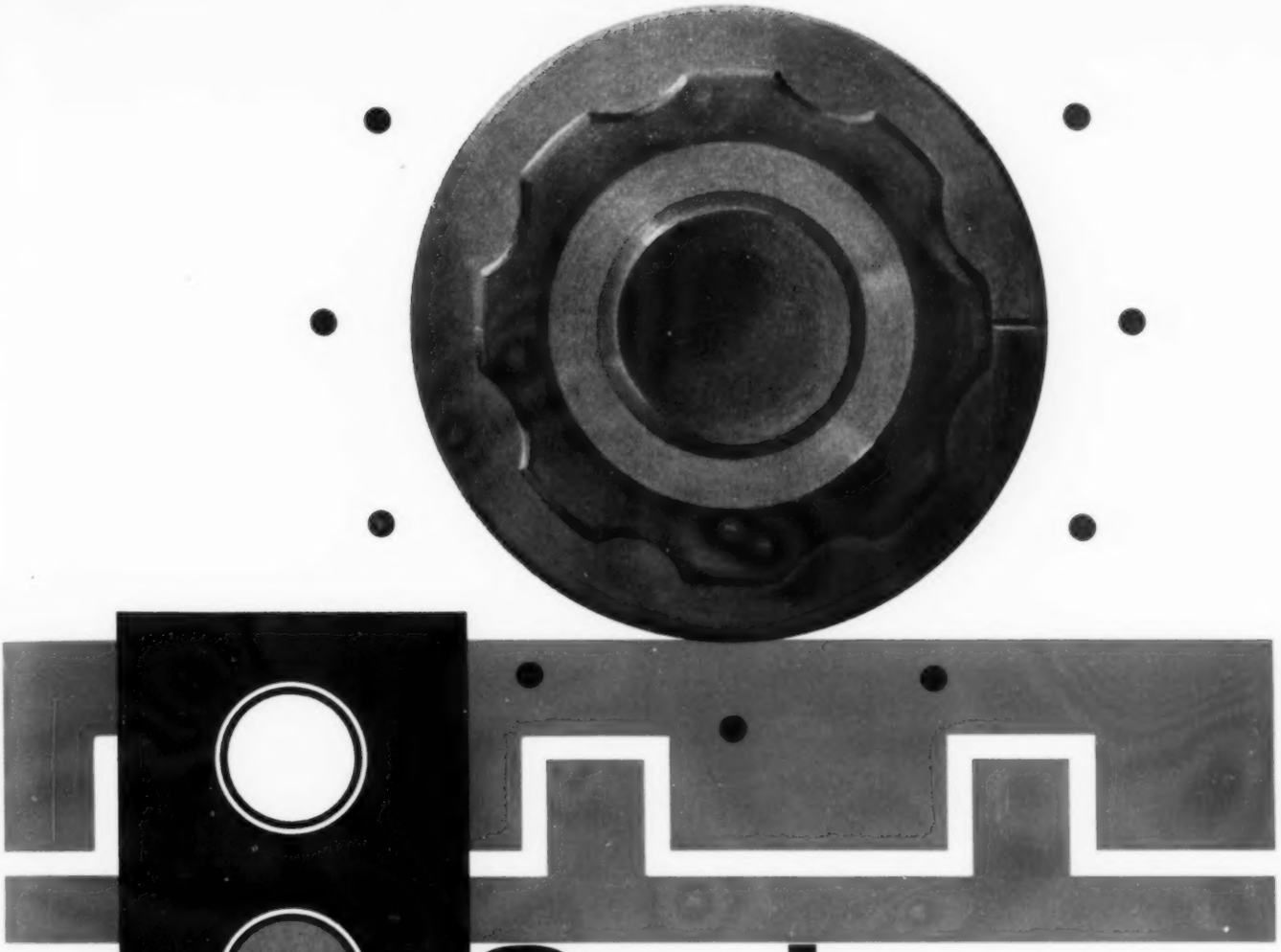

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Magniflux Corporation Appoints Fred A. Meunier Senior Engineer

Fred A. Meunier has joined Magnaflux as senior engineer in the Electronic Engineering Department. He will be responsible for the development of magnetic and eddy current testing instruments for steel tubes and bars. He had been with Republic Steel Corporation for 19 years as production engineer, electrical engineer, and project engineer. He has had experience in the design and plant use of testing, measurement and control equipment.

F. A. Meunier

Dresser Industries Names Carl Maki Executive Vice President Assistant

Carl J. Maki has been named assistant to the executive vice president for Dresser Industries, Inc. Maki had been assistant to the manager of the gas division with Texaco, Inc. Previously he had been with Seaboard Oil Company, Gulf Oil, Mene Grande and Phillips Petroleum.

In his new post, Maki will work on engineering developments in gas applications.

Midwest Piping Company, Inc. Acquires Sparton Facilities

Midwest Piping Company, Inc., has acquired the physical assets of two Spartan subsidiaries, Flori Pipe Company, St. Louis, and Houston Pipe & Steel, Inc., Houston.

The purchase was a part of Midwest's expansion program in expanding facilities for fabrication and erection of piping materials and systems.

Several Promotions Announced By Cooper-Bessemer Corporation

Cooper-Bessemer Corporation announces several appointments in managerial positions. W. P. Johnson was named New York district manager; Donald L. Reed becomes manager, packaged compressor sales; Edward D. Van Fossen is the Canadian Western District manager; and R. L. Moore is now Canadian Eastern District manager.

Johnson succeeds Charles M. Reagle who retired after 35 years service. He is responsible for development of expanding sales markets in New York domestic territory. Joining the company in 1950, Johnson has been in New York district since 1951. Reed retains responsibilities as products manager for gas engine compressor sales. Reed has been with Cooper-Bessemer since 1953 and became gas engine compressor sales manager in 1955.

Van Fossen will direct his operations from Calgary, Alberta, and Moore will headquarter in Toronto, Canada.

Jones & Laughlin Announces Several Store Manager, Sales Appointments

Jones & Laughlin Supply Division announces several appointments affecting store managers and salesmen.

Evan Smith, formerly salesman at Borger, Texas, is now store manager there. B. J. Ford has been promoted to store manager at Pampa, Texas, and W. T. Fleming has been named store manager at Rangely, Colo.

R. J. Bevington, formerly salesman at Freer, Texas, is transferred to McAllen, Texas. R. D. Landis, is transferred from Alice to Freer as salesman. C. L. Wallace, salesman at Houma, La., has been moved to Brookhaven, Miss.; B. W. Ramsey, Lake Charles, La., salesman is transferred to Houma. H. E. Reeves, has been moved from Brookhaven, to Natchez, Miss., and D. R. McKown, salesman at Williston, N.D., becomes Houston salesman.

P. A. Toomey, storeman at Williston, has been promoted to salesman and T. D. Gholson has been assigned as salesman at Houston.

Aerotec Industries Announces Merger of Four Companies

Aerotec Industries, Inc., announces that the merger of four companies has become effective. Aerotec Corporation, Prat-Daniel Corporation, Thermix Corporation and Aerotherm Corporation have elected officers of the new corporation. Louis C. Whiton is chairman of the board, John E. Watson, president, and Jacques G. Mejean was named executive vice president and treasurer.

Aerotec Industries, Inc., will continue to market all products of the merged corporations.

Fluid Controls Institute, Inc. Elects James R. Lawler, Jr., President

James R. Lawler, Jr., of Lawler Automatic Controls, Inc., has been elected president of the Fluid Controls Institute, Inc., at its spring meeting.

Other officers include Fred Weldon, General Controls Co., first vice president; Robert McCormick, Automatic Switch Co., second vice president; Paul Rogers, Jr., Skinner Chuck Co., treasurer; Eric A. Bianchi, Mason-Neilan, Division of Worthington Corp., corporate secretary; and E. R. Rath, Fluid Controls Institute, Executive secretary.

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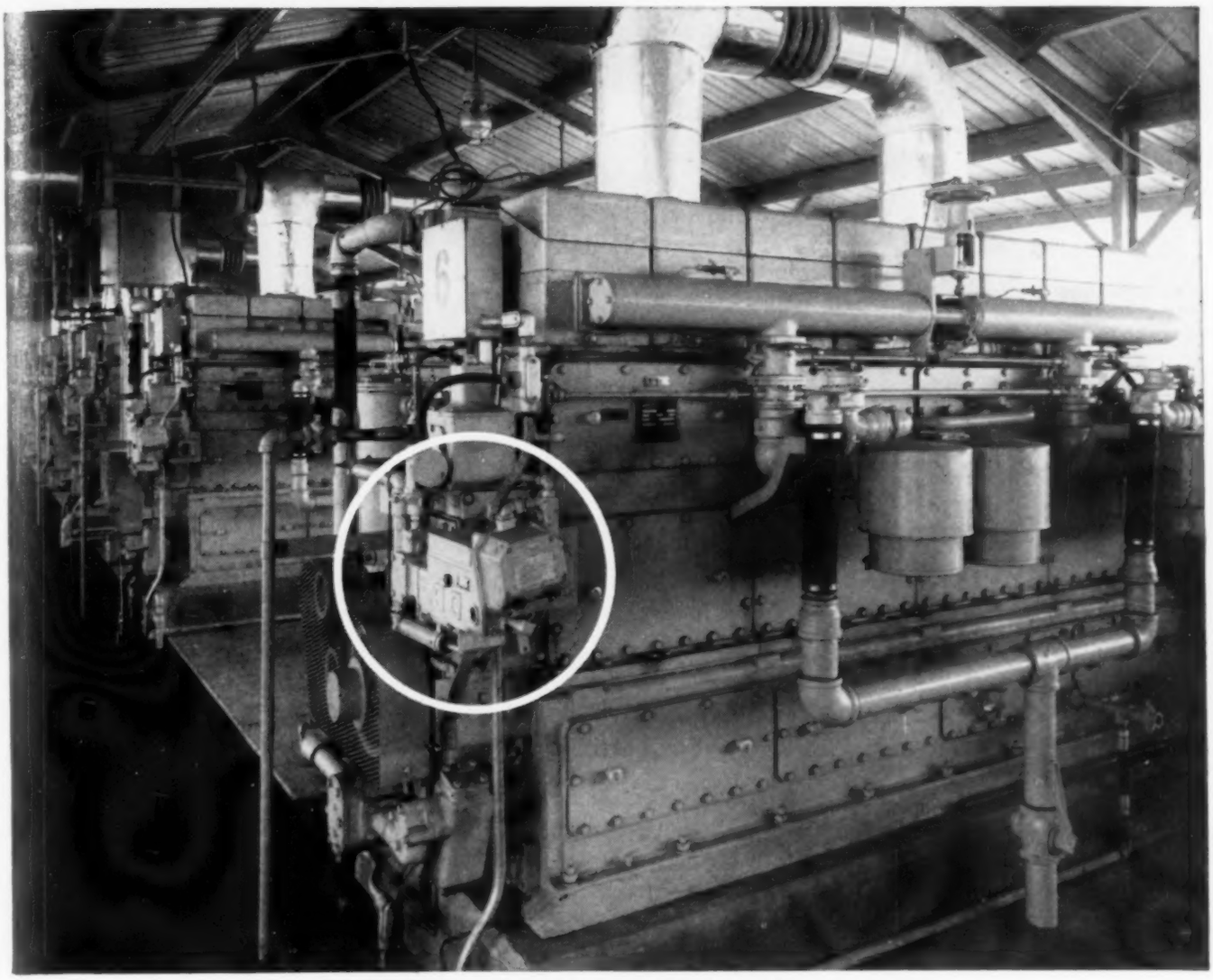

Circle indicates Bendix LC magneto on White Superior engine at Long Beach.

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Long Beach, California, operates what may become the world's largest water-flooding plant—drawing water from the Pacific Ocean and pumping it into the Wilmington Tract beneath the city. The additional pressure created will aid in oil recovery and, it is hoped, will reduce land subsidence in the area.

Currently operating at a rate of 120,000 barrels per day, the capacity will be increased and may eventually reach 1,000,000 barrels per day—which would make it the world's largest project of its kind.

The plant is powered by eight White Superior gas engines equipped with Bendix* LC magnetos and HI-V transformer coils. These matched ignition systems, noted for long service life, simplified maintenance at low cost and complete operating reliability, can be used with engines of from six to sixteen cylinders.

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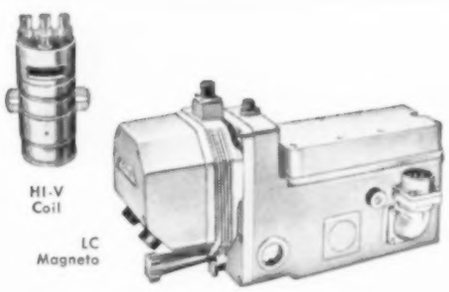

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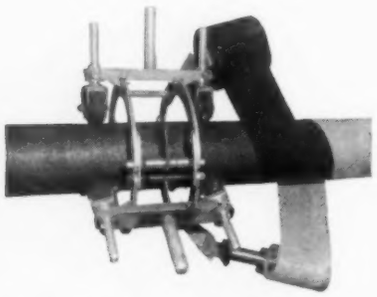
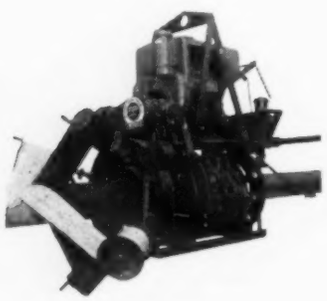
HERE ARE MACHINES THAT BRING ADDED EFFICIENCY TO YOUR TAPING AND CLEANING AND TAPING.



The MYOCO Tapemaster can use four arms to give any combination of tape and kraft or felt. Six various size machines available for ½" through 36" pipe; small machines use tape from ½" width through 9", large machines use 9" through 18" tape.



MYOCO Model OW Power Driven Cleaning and Taping machine combines two operations for increased speed of operations with less equipment. Line travel machines are available to handle pipe sizes 3" to 6", 6" to 12", and 14" to 20". A Wisconsin Model Vg4D V-type 4-cylinder heavy-duty air cooled engine, combined with the design and engineering features of this machine, guarantees uninterrupted service.

When you use MYOCO pipeline equipment, you quickly find that servicemen are experienced and available twenty-four hours a day, with fast transportation available to serve you in any way; efficient equipment operation is assured by periodical checks; and if possible, parts and supplies are shipped the same day ordered.

MORRIS-YOUNG-OWENS CO. PIPELINE EQUIPMENT AND SUPPLIES MYOCO

MORRIS-YOUNG-OWENS CO.

PIPELINE EQUIPMENT AND SUPPLIES

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In Canada: MYOCO LTD., 30 Bloor St. West Toronto 5, Ontario, Canada, Tel. WA 2-9444

Gwilym A. Price Chosen John Fritz Medal Winner

The John Fritz Medal, highest honor that engineers can bestow, will be presented to a leading industrialist without an engineering background. The award board announced that Gwilym A. Price, chairman of the board of Westinghouse Electric Corporation, will receive the honor at the annual ASME meeting at Atlantic City, early in December.

Representatives of four national engineering societies chose Price for "his inspirational leadership, industrial pioneering and personal initiative in marshalling the creative forces of research and engineering to the cause of developing atomic power for the national defense and for the human welfare."

The John Fritz Medal award was established in 1902, in memory of John Fritz, pioneer in the iron and steel industry. The ASME, American Institute of Mining, Metallurgical and Petroleum Engineers; American Institute of Electrical Engineers and American Society of Civil Engineers are the four societies from which the board was selected.

Price joined Westinghouse in 1943 as a vice president, became president in 1946 and chairman of the board in 1955. He also is president of the board of trustees of the University of Pittsburgh and since 1957 has served as chairman of the board of Crusade for Freedom, Inc. He is a trustee of Carnegie Corporation of New York and the Committee for Economic Development.

Donald J. Cox Appointed New Kerotest Sales Representative

Kerotest Manufacturing Company announces the appointment of Donald J. Cox as steel valve and sales representative. Cox has been associated with the company since 1957 as a demonstrator of Kerotest steel products. His sales territory includes states of California, Nevada, Utah and Arizona. His headquarters will be in Los Angeles.

D. J. Cox

United States Steel Corp. Promotes Two Vice Presidents

Marcus M. Chapman has been appointed an administrative vice president, commercial for United States Steel Corporation. Howard J. Mullin will succeed Chapman as vice president, sales of the corporation.

Chapman joined the steel firm in 1922 as a trainee. He was named a salesman in 1924 and became assistant to sales manager in the Chicago district in 1936. He was promoted to manager of sheet and strip sales division in 1952 and made assistant vice president of sales-distribution in 1957. Mullin joined the company in 1927, and in 1955 he was named manager of sales, New York district. He became assistant vice president-sales distribution in 1957.

General Electric Appoints G. Stanley Sherland Engineer

G. Stanley Sherland has been appointed turbine application engineer for General Electric Company's Pacific Northwest District.

In 1956, Sherland transferred to the General Electric turbine specialist training program and served at plant locations in Schenectady, N. Y., Fitchburg and Lynn, Mass. Previously he had served five years in service engineering and then joined General Electric Company's turbine installation and service engineering organization.

Martin L. Case Promoted By International Harvester Company

Martin L. Case has been named assistant manager of International Harvester Company's Melrose Park, Ill., works. He succeeds Earl P. Dacy, who has been appointed manufacturing manager of the company's Australian subsidiary.

Warren A. Mortonson replaces Case as general superintendent at Melrose Park. Case joined the firm in 1926 and served as foreman and general foreman at Milwaukee and Indianapolis Works. Mortonson's latest position was that of job evaluation and classification general supervisor.

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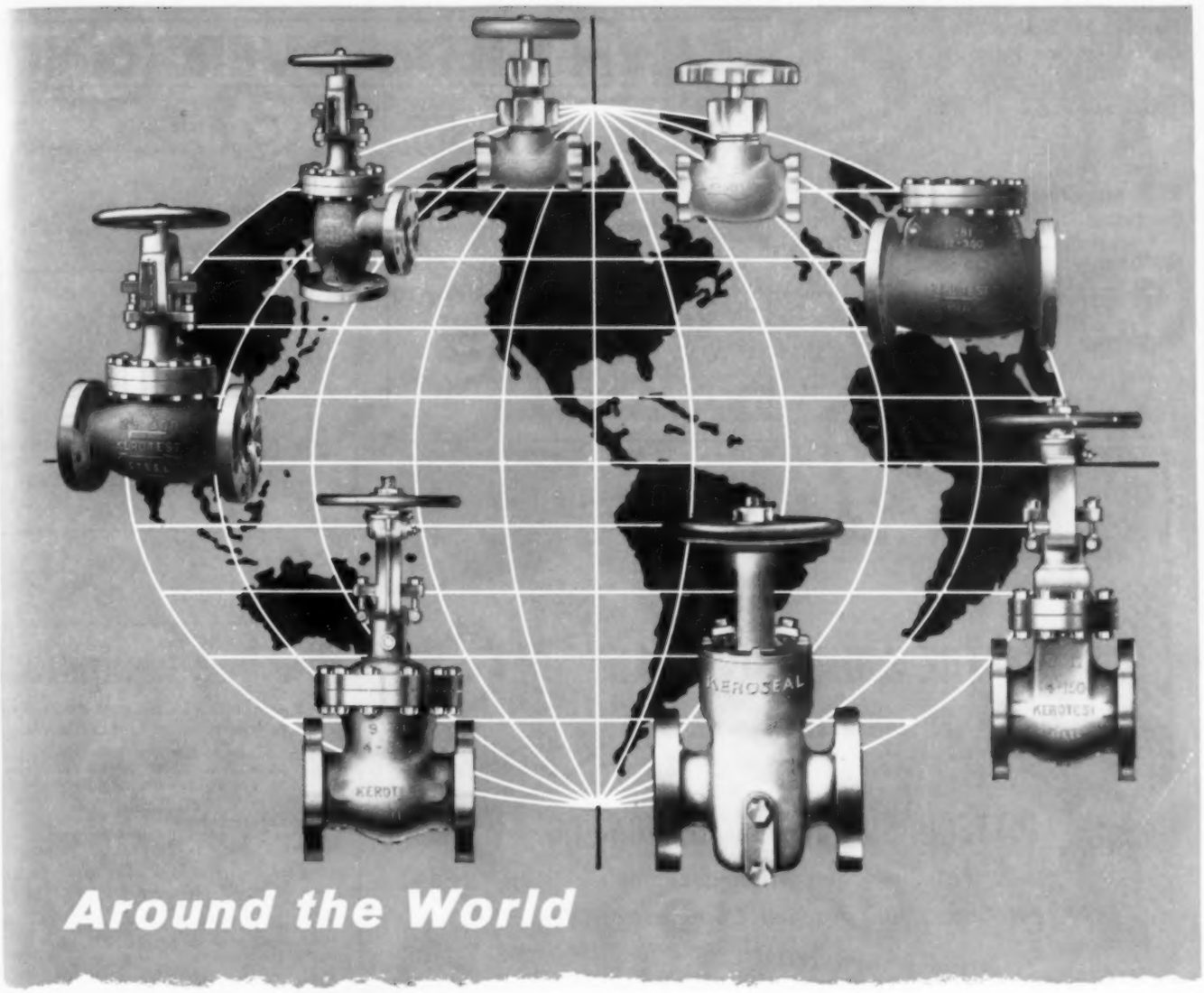

. . . and 50 Years of quality VALVES

Visit oil and gas industries, processing and other industrial plants in any country in the world and you will find Kerotest Valves at work in a multitude of jobs. This universal acceptance of Kerotest Valves is the result of a continuous effort toward product improvement ever since the company was founded in 1909.

Around the world and 50 years later, Kerotest still continues to make highest quality valves, with consistent effort toward even greater product improvement. Each step in Kerotest Valve manufacture, from raw materials to final rigid inspection, is the result of research and engineering directed solely to obtaining better product performance on the job. The results of these efforts have set Kerotest Valves apart from the ordinary and have maintained their high standards of quality everywhere.

For additional information on valves for your requirements, write today for the latest Kerotest brochure.

KEROTEST QUALITY VALVES FOR EVERY REQUIREMENT

- Gate Valves
- Globe Valves
- Angle Valves
- Check Valves
- Pipe Line Valves
- Positive Shut-Off Valves
- Production Valves
- Needle Valves
- Well Head Equipment
- General Purpose Valves
- Special Valves

KEROTEST MANUFACTURING COMPANY

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In Canada, Kerotest products are manufactured and distributed exclusively by Guelph Engineering Company, Guelph, Ontario.

KEROTEST

Herbert H. Hodgeman Joins Daniel Orifice Fitting Co.

Herbert H. Hodgeman has joined Daniel Orifice Fitting Co. as valve design engineer. Hodgeman formerly did consulting engineer work in Houston and has been with the A-1 Bit and Tool Co. and Housh Fortune Plant.

R. B. Magerman General Manager of Electronic Heating Engineering, Inc.

A newly organized firm has been opened in Houston at 6523 Eppes. Electronics Heating Engineers, Inc., serving the Gulf Coast, Dallas and Shreveport, La., areas will provide induction heating processes and servicing.

Richard B. Magerman has been named general manager of the new firm. He formerly was assistant sales manager and service manager for the Welduction Corporation.

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3—Cat D8 Tractors w/MD8 Pipelayers and Counterweights. Excellent Condition—$12,500 to $16,500.

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BARGAINS!

28 Walworth 8" Gate Valves—Model 841-1. These valves are new and in perfect condition. Price $125.00 each.
1 Worthington Steam Driven Reciprocating Pump, 5¼ x 3½ x 5. The pump is new and in perfect condition—$200.00.
Write: Elmer A. Rucker, R.R. 1, Box 197, Staunton, Illinois.
All prices FOB Staunton

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Pipeline Equipment

This Merchandise Located At Perry, Florida; Fort Worth, Texas and Eustis, Florida

TD24 International S/N TDE-5806, with Bucyrus-Erie Angle Dozer, P-29 DDPCU, fair condition, good undercarriage, recently overhauled engine $6800.00

TD-24 International S/N TDE-5261, with Bucyrus-Erie Angle Dozer P-29 DDPCU, fair condition, good tracks $6800.00

TD-24 International S/N TDE-3966, Superior side boom #B1-24C-249, Hydraulic Counterweight, good condition, fair tracks $7500.00

TD-24 International S/N TDE-3358, with Superior side boom # BP1-24C-238, good condition, good tracks $7500.00

TD-18A International S/N 30375, Bare tractor, fair condition $3500.00

TD-18A International S/N TDR-13813 with Caldwell side boom attachment, fair condition, new rails $4250.00

D-7 Caterpillar S/N 3T22501 with Trackson side boom No. 40C-32, good condition, good undercarriage $9750.00

D-8 Caterpillar S/N 2U3672 with Trackson MD8 side boom No. 1505, good condition, good tracks $6500.00

HD-19 Allis-Chalmers S/N 383 with Berg side-boom G-1919, fair condition, fair undercarriage $3900.00

Lincoln Welders, 300 AMP, powered by 2-71 GMC diesel engines, each unit test run, good condition $950.00

Rock Rakes, complete, with side arms, for TD-24, excellent condition $1250.00

Cleveland Ditcher Model 320, S/N K175, with 36" buckets, trencher in very good condition: powered by D8800 Caterpillar engine. F.O.B. Eustis, Florida, will load and block $18,000.00

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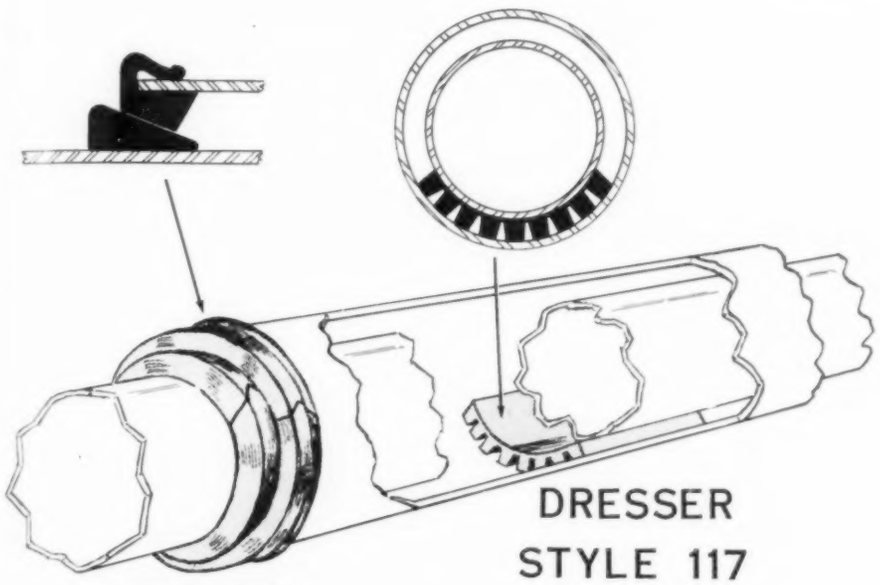
What's New in EQUIPMENT



Insulating Seal

Introduction of a new insulating seal and casing cradle is announced by Dresser Manufacturing Division. Performing a dual role, the insulating seal Style 116 provides sealing and insulation of casing ends by new design of the double gasket. Casing gasket hooks over the casing end and extends inside the casing. The wedge-shaped carrier gasket, which fits around the pipe, is driven into position against the carrier gasket. The seal completely fills the annular space between pipe and casing at casing ends.

The casing cradle, Style 117, provides permanent insulation and support between the carrier pipe and casing at the casing end. It also centers the pipe in the casing to help the insulating seal do a more effective job. The cradles have ample strength to support pipe line contents and backfill load.

The casing cradles are constructed of a maximum of hard rubber skids bonded to a pliable rubber impregnated fabric sheet. Dresser also has available its new line of couplings and fittings for joining grooved-end pipe. The line, "Kupl + Lok," Style 98, includes couplings, ells, tees, reducers and line caps. The 98-1 series is for working pressures to 500 psi and 98-2 for working pressures to 1,000 psi. Both are available with Grade 30 gaskets for general service or Grade 69 gaskets for oil and gasoline.

For more data, circle **No. E1** on Readers' Srvice Card, last page this issue.

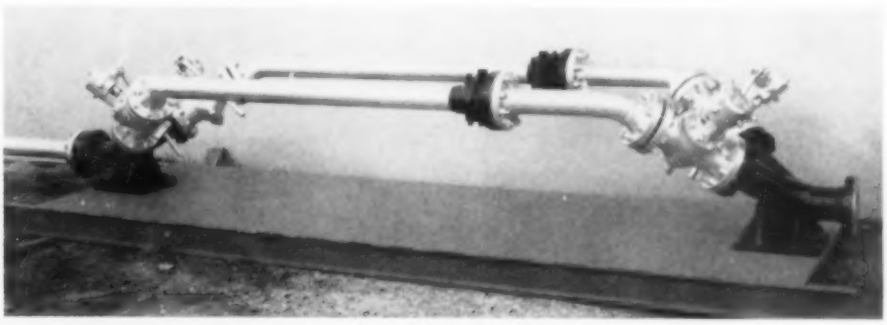
Pressure Gages

The "Master-test" line is the name given to Marsh Instrument Company's new line of pressure gages. Made in all standard pressure ranges, the series of gages is individually dead-weight tested and guaranteed accurate with ¼ of 1 percent plus or minus of maximum dial reading over entire range.

Reading accuracy is obtained with a new type dial, "Readeasy" dial, in which an inner arc shows major marking and an outer mark shows the finer graduations.

This item supplements Marsh Instrument Company data on page 273 of the Pipe Line Catalog, Second Revision.)

For more data, circle **No. E2** on Readers' Service Card, last page this issue.



Flow Distributor

Developed to provide equal flow distribution between two fluid-flow runways the Rutherford Company Inc.'s flow distributor is designated Model 5,000.

It is of cast steel construction, with a base adaptable for mounting on a concrete or other type foundation. Flange connections are to requested specifications. Advantages of the flow distributor include: better flow distribution between dual run-

Submersible Pump

Worthington Corporation announces its submersible pump with ultra-high flow design. The pump maintains high efficiencies over wide operating ranges under a variety of operating conditions. Designed for use with deep settings and high heads, the pumps also are appropriate where a minimum of space is available.

For more data, circle **No. E3** on Readers' Service Card, last page this issue.

Single Stage Compressor

Allis-Chalmers Manufacturing Company is expanding its scroll case, single stage compressor line. Redesigned line consists of three styles, B, C and D. The compressors are suitable for wide range of application including gas boosting and exhausting. The B style for low pressure, low volume service is close coupled to a standard round frame, flange type, 3,600-rpm motor mounted on the compressor backplate. Impeller is positioned directly on the extended motor shaft.

The C style compressor, suitable for speeds to 3,600 rpm, is base mounted, pedestal bearing machine incorporating self-aligning ball bearings. These bearings are mounted in horizontally split, cast iron, pillow block housings. The D style compressor, capable of higher pressure ratios and greater volume, has wider flexibility than B and C.

The thrust loading in the D style is absorbed by a double acting Kingsbury thrust bearing mounted between two load bearings to reduce the total overhang.

(This item supplements Allis-Chalmers Manufacturing Company data on Pages 41-44 of the Pipe Line Catalog, Second Revision.)

For more data, circle **No. E4** on Readers' Service Card, last page this issue.

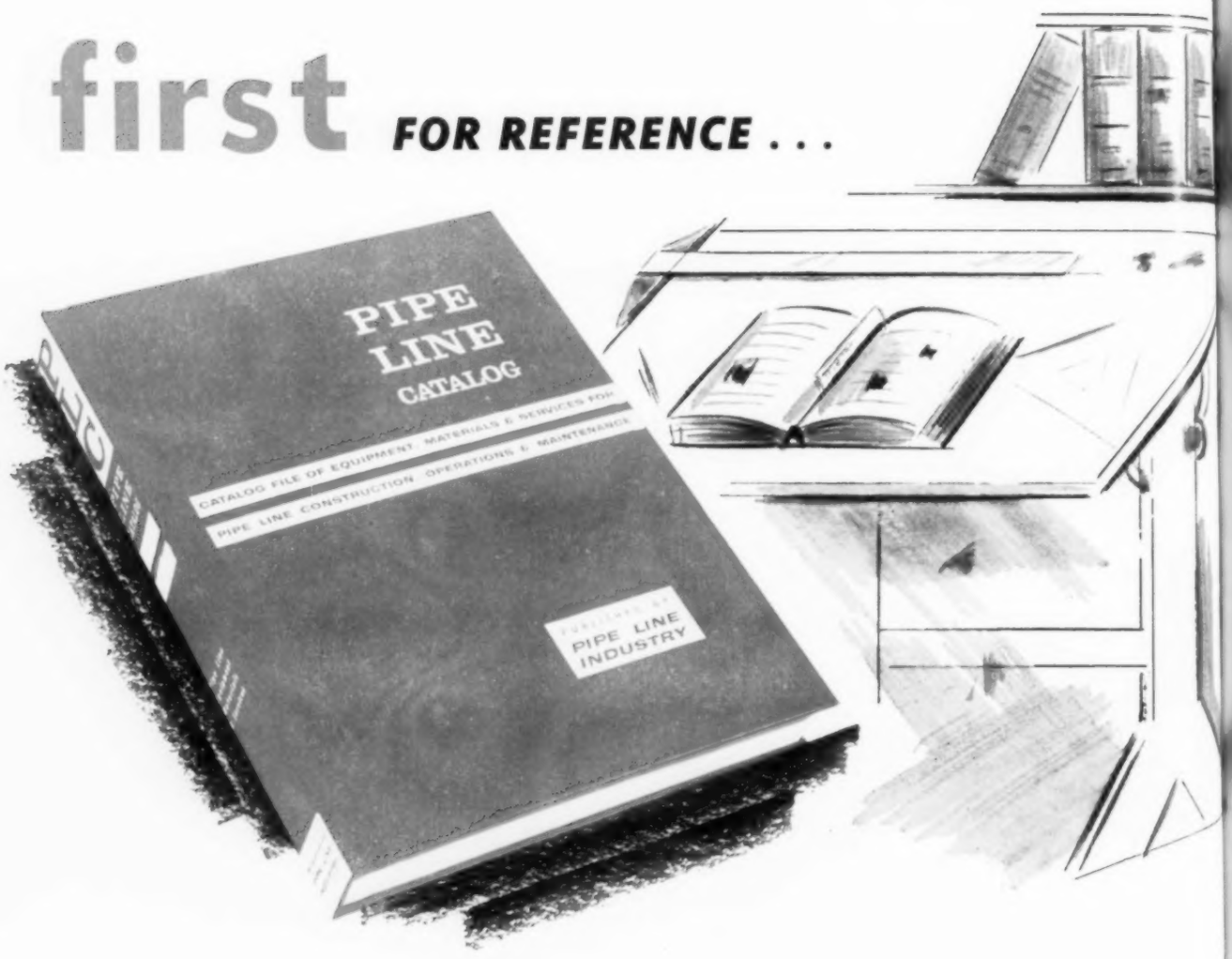
Warning Light

Pacific Mercury has introduced a new dome head flasher warning light with full 360 degree visibility. Available in transistor neon or transistor incandescent models, the light comes with or without Solarstat which ends manual attention. This automatically turns on the light when sun goes down, turns it off when sun rises.

Thick optical quality Lucite lens of dome head is rated shatterproof and special lens design has doubled visibility. Rugged alloys in outer housing insure damage-resistant casing.

For more data, circle **No. E5** on Readers' Service Card, last page this issue.

first FOR REFERENCE . . .



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PIPE LINE CATALOG

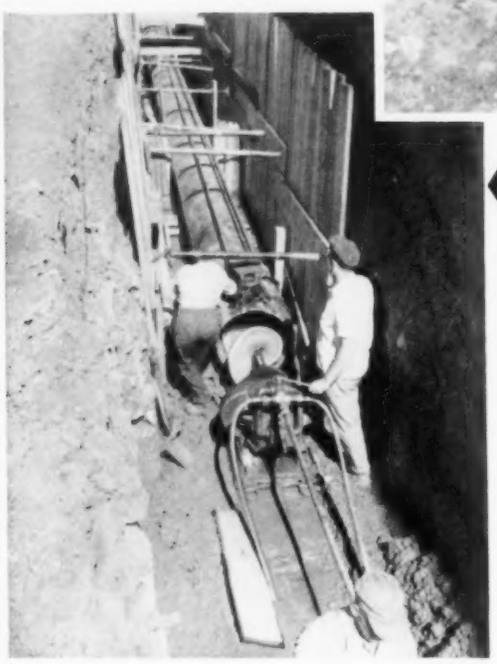
Published by PIPE LINE INDUSTRY

P. O. BOX 2608 HOUSTON, TEXAS

Drilling with KA-MO . . .

6-in. bore under street —

Drilling 6-in. diameter hole, 40 ft. long under city street for gas line . . . this unit is powered by a 6 h.p. air motor using a standard double-track mounting. Ka-Mo drills are rugged, versatile . . . handle all materials from sand, clay, gumbo to frozen ground, shale, limerock . . . and other mineral formations.



24-in bore inside casing

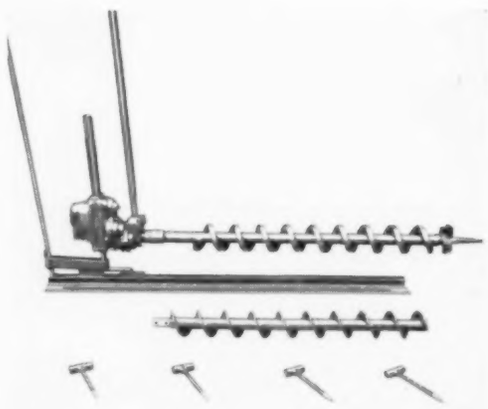
Powered by an 18 h.p. air motor . . . Ka-Mo horizontal drill quickly bored 24-in. diameter hole inside casing, 106 ft. long through compacted clay and ballast under a railroad bed for new gas distribution line. *Actual drilling time . . . only 4 hours!* Casing and drill move forward at same time, protecting against costly cave-ins.

Whether your work involves angular, vertical or horizontal drilling, it will pay you to check the big Ka-Mo line. Drill sizes: 2 to 48-in. diameter, and larger . . . sectionalized lengths . . . air, hydraulic, electric, gasoline or diesel powered.

Light, portable —

Here's a "close-up" of a 6-in. dia. horizontal drill with 6 h.p. vane type air motor and single-track mounting. It's light, portable, easy-operating. Speeds installation of distribution and service lines under walks, streets, railroad beds, etc. Other sizes in this series: 3 to 14-in. dia., in sectionalized lengths, with single or double-track mounting.

Special engineering service always available on difficult drilling or boring problems. Call any time!



Mail to: KWIK-MIX CO., Ka-Mo Tools Dept., 1845 South 55th Ave., Cicero 50, Illinois

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COMPANY .....
STREET .....
CITY, STATE .....

Send free data on:
☐ horizontal ☐ vertical
☐ angular drilling equipment
☐ pipe anchor install. equip.
Dia. of hole .....inches
Length of bore .....feet
Type soil .....

KAM905 PI

KA MO KWIK-MIX COMPANY — Ka-Mo Tools Dept.
A DIVISION OF KOEHRING COMPANY

ways, minimizes pressure drop through a given installation, it is deterrent to build-up and retention of foreign matter, lightweight and portability.

For more data, circle **No. E6** on Readers' Service Card, last page this issue.

Information System

Fischer & Porter Company has developed an integrated pipe line information system for accurately measuring, transmitting, indicating and recording flow, pressure, temperature and other variables in digital form. The system measures variables at remote points and relays data by means of standard communication or telemetering equipment to a central control station; it is then converted into digital form and record by automatic typewriter.

An analog-to-digital converter converts and displays telemetered data continuously in digital form at the station. The system also features continuous alarm monitoring with adjustable high-low set points.

For more data, circle **No. E7** on Readers' Service Card, last page this issue.

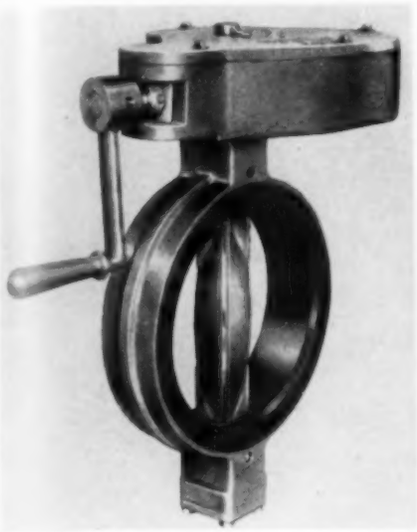
Tractair Compressor

Le Roi Division has made several engineering design changes in its 125 Tractair, combination tractor-air compressor. A single-stage, piston-type compressor is built integrally with a 42-horsepower engine. The self-propelled tractair provides 125 cfm of air compressed to 100 psi. The unit can travel from job to job at speeds up to 15 mph and climb or work on a 2-to-1 slope.

New features include a longer hood providing a protective covering for the battery and also bringing the instrument panel closer to the operator. Gages are

grouped on the one panel and are in easy-to-read white numerals and letters on black background. The hood section can be taken off for quick inspection and maintenance by removing only six bolts.

For more data, circle **No. E8** on Readers' Service Card, last page this issue.



Butterfly Valve

Henry Pratt Company announces a new line of rubber seat butterfly valves, the Monoflange Mark 11. It is offered for 150 psi tight shutoff in sizes 4-inch through 20-inch. A wide range of material trim and valve actuators for manual or automatic operation is available.

For more data, circle **No. E9** on Readers' Service Card, last page this issue.

Instrument Air Drier

The American Instrument Company announces a high-pressure gas-drying system which contains new features. The system is composed of three basic units: the drier, hygrometer moisture indicator and the Corbin diaphragm-type compressor.

The drier is automatic dual-assembly, one which furnishes super-dry gas to the system, and the other which undergoes reactivation. The apparatus includes a drying tower and dust filter.

The compressor operates by action of hydraulically pulsed diaphragms which keep gas separated from lubricants.

For more data, circle **No. E10** on Readers' Service Card, last page this issue.

Rotary Selector Switch

Designed for use on electronic and computer panels, Micro-Switch has introduced a new series of rotary selector switch assemblies.

The assemblies feature a cock and fire actuating mechanism and non-tease cir-

BIG Parsons® 420 Trenchliner...

Digs 36 to 52 in. wide... 7½ FEET deep

Today you'll find the right answer to your cross-country work and other big trenching jobs in Parsons 420 Trenchliner®. Developed especially for big work schedules, it has the extra capacity, performance and dependability you need to open trench at lowest cost per lineal foot.

Digging from 36 to 52 inches wide at depths to 7½ feet, this heavy-duty wheel-type machine produces up to 25 lineal feet of trench per minute. With all this extra capacity you still get smooth, precision wheel control. Double-action hydraulic rams actuate digging wheel — give infinite depth selections, maintain close grade tolerance in toughest digging. Heavy-duty wheel has formed steel-plate buckets, solid or tine-back, with replaceable point-type teeth.

Hydraulic control system on conveyor gives belt speeds up to 621 feet per minute — *completely independent of digging wheel speeds.* Belt easily handles maximum yardage from the extra-wide wheel — puts spoil bank well back beyond edge of trench. See Parsons distributor, or write for more facts.

Need deeper trenches on your cross-country work? Then check this larger companion model 520 Trenchliner. It produces up to 28 lineal feet of trench per minute — 40 to 52 inches wide at depths to 8½ feet. Parsons offers a complete line of wheel and ladder-type Trenchliners. In addition to the 420 and 520, there are 3 smaller wheel types — and a choice of 5 heavy-duty ladder type Trenchliners.

Mail to: PARSONS COMPANY, NEWTON, IOWA *Send literature on:* ☐ 420 Trenchliner ☐ 520 Trenchliner

NAME_____

TITLE_____

COMPANY_____

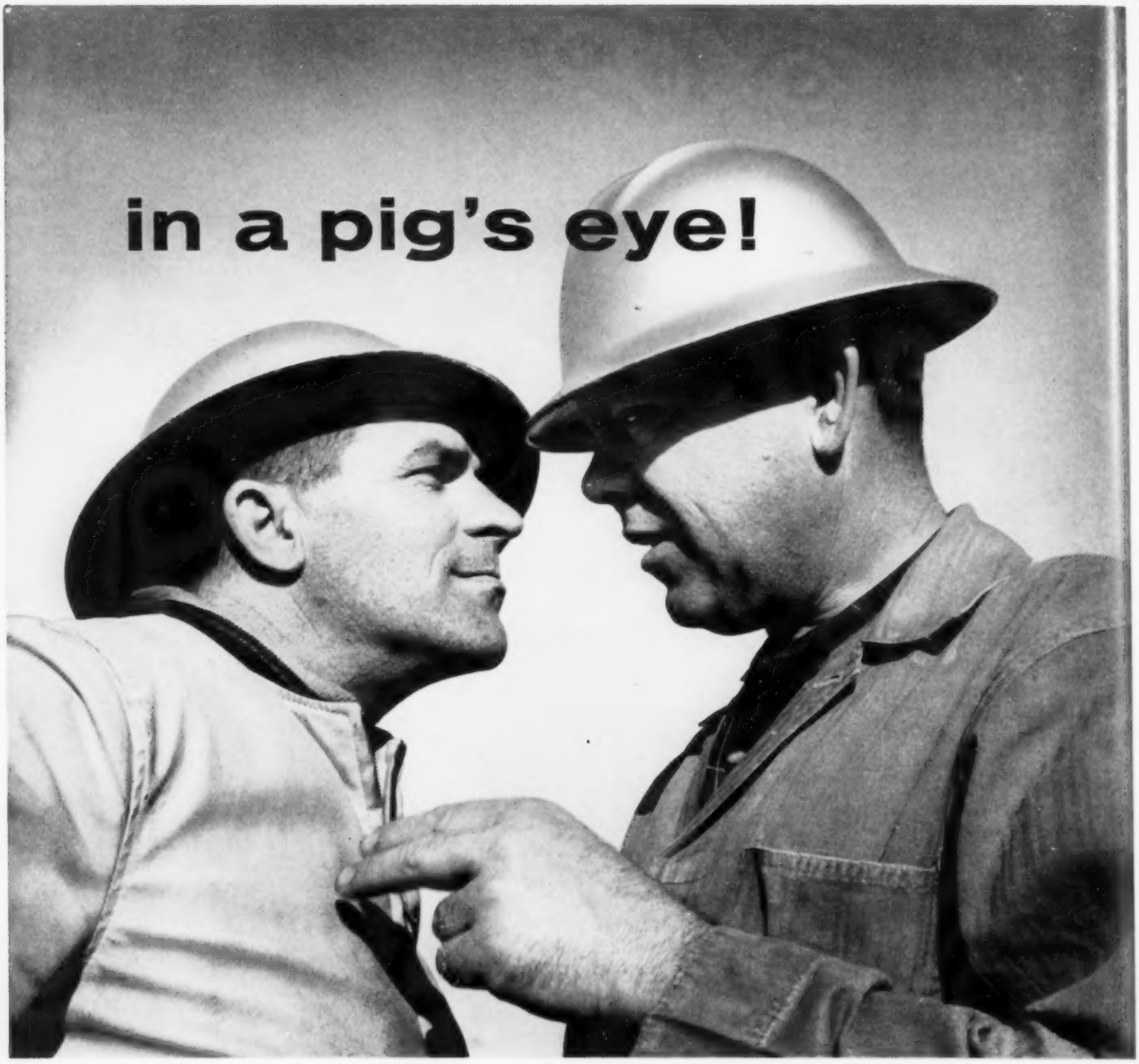
DIVISION_____

STREET_____

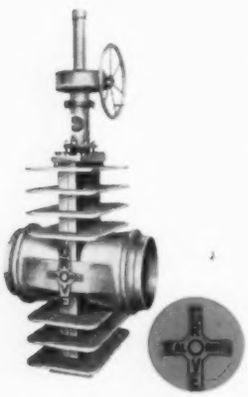
CITY, STATE_____

(A Division of Koehring Company) P932 PL

TRENCHLINERS for PIPELINERS



THERE IS A DIFFERENCE IN VENTURI VALVES



The difference is Grove's compact body design. It permits a long, gradual taper of venturi valve hubs that gives you better flow characteristics than any other reduced opening valve. Ordinary valves have thicker bodies and a sharper taper of venturi hubs, causing increased line turbulence and resulting pressure loss.

Even with a port reduction of two to four basic pipe sizes, Grove Seal-O-Ring Venturi Valves have comparable flow capacity and pressure loss to so-called "full ported" rectangular port plug valves. And, they cost less too.

Before you buy any other valve, ask your local Grove man to give you the complete story on these fine valves.

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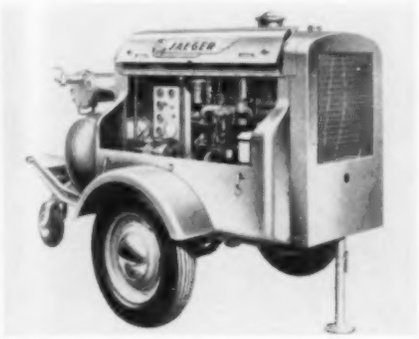
5438

curacy. They can be provided with two to eight plastic-enclosed single-pole/double-throw basic switches and two or three actuator positions. Detents are 90 degrees. A variety of switching sequences can be factory adjusted to fit requirements; individual actuating levers pivot on a common rod, insuring maintained adjustment. Levers are operated by precision cams rigidly mounted on the actuator shaft in the desired operation sequence.

For more data, circle **No. E11** on Readers' Service Card, last page this issue.

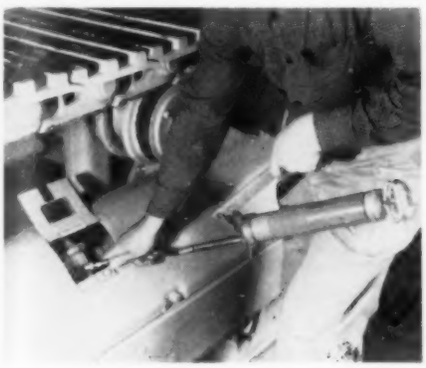


Rotary Compressor

Jaeger Machine Company's 85 cfm rotary compressor is powered with Continental F-162 engine developing 45 hp at sea level and equipped with 12-volt electric starter.

Standard equipment includes hour meter, automatic blow-down valve, thermostatically actuated oil by-pass valve, retractable pneumatic tired dolly wheel and fenders. A single stage oil-cooled rotary compressor develops 85 cfm at normal 100 psi. Pressure is held constant and speed is smoothly modulated without possibility of over-run or racing of the engine.

For more data, circle **No. E12** on Readers' Service Card, last page this issue.



Track Adjustment

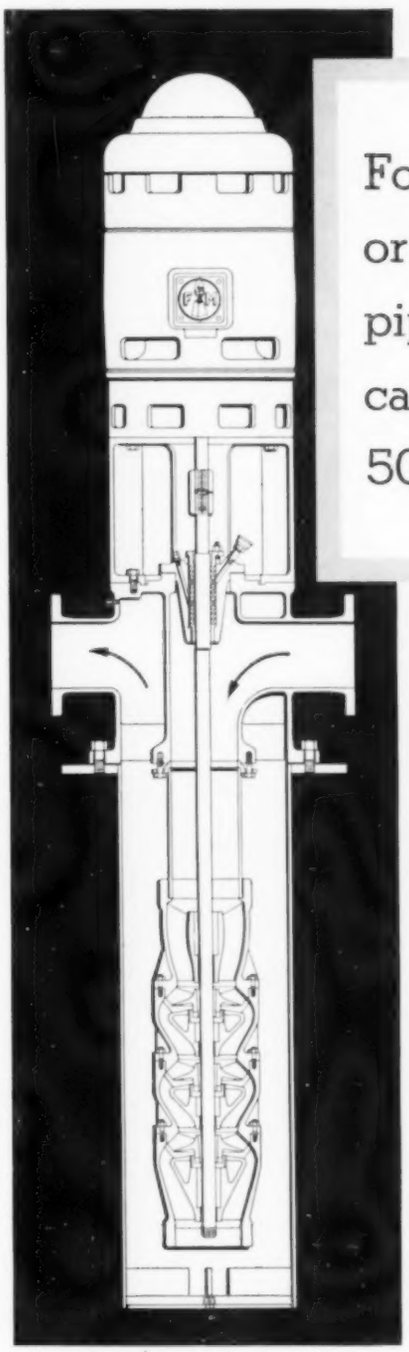
Caterpillar Tractor Company announces its hydraulic track adjustment as attachments for the D4 and D6 tractors and No. 977 Traxcavator.

The adjustments allow track tension to be adjusted with a standard hand-operated grease gun and replace the former bolt-and-wrench system. The method encourages operators to correct track tension at proper intervals which should prolong tractor life.

(This item supplements Caterpillar Tractor Company data on pages 76-79 of the Pipe Line Catalog, Second Revision.)

For more data, circle **No. E13** on Readers' Service Card, last page this issue.

NEW Fairbanks-Morse Inverted Pot-Type Turbine Pump for pipeline service



For crude
or product at
pipeline pressures,
capacities to
50,000 bbl. per day

This advanced-design pump cuts initial and operating costs 4 ways: (1) Rugged, uncomplicated construction—only one moving part. (2) High-pressure packing problems are minimized—the packing gland is in the suction line. (3) Permits increasing pressures without decreasing capacities. (4) Minimizes maintenance with recognized Fairbanks-Morse quality, including denser, tougher Pomoloy cast iron and lifetime Fairmortected surfaces.

Installations may be single or in series, depending on specific components selected for head capacity requirements. Power may be F-M direct electric drive, or right-angle drive with F-M motor or O-P diesel.

For complete information on the new Inverted Pot-Type Turbine Injection Pump, write Fairbanks, Morse & Co., Oilfield Division, 1713 N. Market St., Dallas 2, Texas.

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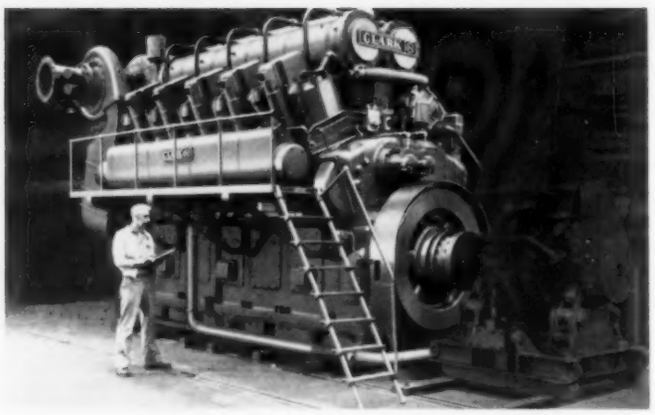
COMPRESSORS • GENERATORS • SCALES • MAGNETOS • HOME WATER SYSTEMS



Two-Cycle Gas Engines

Clark Bros. Co. has developed a V-Type, turbocharged two-cycle gas engine which will be built in sizes up to 6,400 bhp. Designated TPV, it is designed for centrifugal compressors in booster stations, for power generation and pump drive. Featuring 17 inch by 19 inch bore and stroke, the engine will be built in three sizes, 10, 12 and 16 power cylinders rates at 4,000, 4,800 and 6,400 bhp respectively.

The V-engine combines low fuel consumption with simplicity, reliability and low maintenance costs. The TPV is equipped with a jet started turbocharger. At normal operating conditions, it is completely self-sustaining and imposes no parasitic load on the engine. Turbocharger speed is automatically matched to the engine.

Power pistons are the two-piece, oil-cooled type. Other features include aluminum main and connecting rod bearings, full pressure lubrication, fully insulated exhaust manifolds, fin and tube type scavenging air intercooler, enclosed and lubricated fuel injection valve gear and two centrifugal water pumps to handle jacket water and scavenging air cooling.

For more data, circle **No. E14** on Readers' Service Card, last page this issue.

Photo Courtesy of Shell Oil Company

WISCONSIN-POWERED *Sea-Going "David Buggies" Expedite Under-Water Exploration*

Shown above is a specially designed sea-going "David Buggy" tractor working with an aquatic shot-hole rig in a shallow bay on the southwest coast of Texas. The drilling rig is mounted on a trailer fitted with aircraft tires. The "David Buggy," supplied by the Applied Research Development Co., of Houston, Texas, is powered by a 4-cyl. 30-hp. VH4D Wisconsin Heavy-Duty Air-Cooled Engine. The tractor rides on extra-wide, hollow-metal wheels . . . heavily cleated for traction in soft mud.

This is a more or less typical application of WISCONSIN Engine Power to the many and varied power jobs connected with oil-field operations. Whether operating oil pumps, pipeline units, salt-water disposal pumps, pipe-bending machines, mud "bazookas," dope kettles, pipe-testing equipment, air compressors, standby power units or any of a great diversity of oil-field utility units . . . Wisconsin Air-Cooled Engines meet the power demands of the job and the equipment.

Available in a complete power range from 3 to 56 hp., in single cylinder, 2- and V-type 4-cylinder models, these heavy-duty engines have what it takes for rugged service under *your* conditions . . . in any location, under any climatic conditions. You get full-time load-lugging power, low-cost operation and maintenance, and long engine life. Good reasons why it pays to specify "Wisconsin" for your equipment.

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Time-Cycle Controller

An improved time cycle controller, Model CIC500, providing increased flexibility for controlling processes based on timed operations has been introduced by Bristol Company.

Ten pilots, pneumatic, electric or a combination, may be operated simultaneously or in any sequence. Each pilot can perform up to 24 operations. Intervals between operations can be as brief as 4 seconds, and timing discs range from 0-15 minutes to 0-360 minutes. Variations of the basic model offer standard pneumatic pilots, high capacity pneumatic pilots, spdt switches, dpdt switches and special purpose switches.

For more data, circle **No. E15** on Readers' Service Card, last page this issue.

Brushless Generator

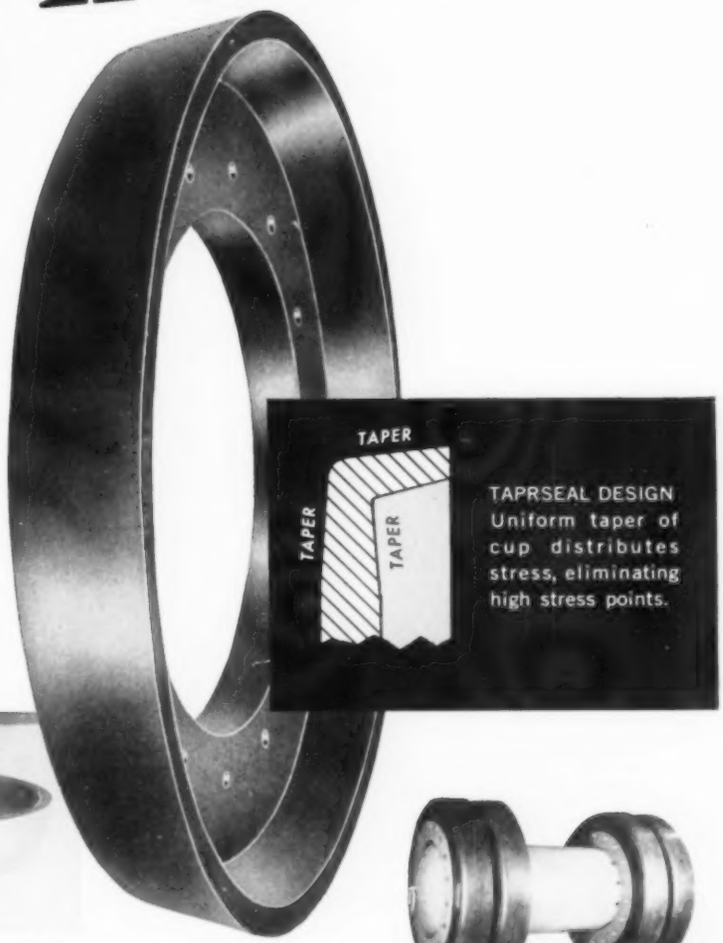
Designed to eliminate sparking, Allis-Chalmers Manufacturing Company's new package brushless generator is applicable to construction work and industry work.

Shorter and streamlined in appearance, the generator has it's auxiliary equipment compactly mounted within the yoke enclosures. The design permits direct mounting of a switchboard on top of the unit, keeping cable runs to a minimum length. The voltage generator provides strong field forcing to minimize voltage deviation at the

NEW WmSON TAPRSEAL®

SCRAPER CUP

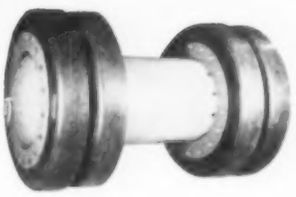
OFFERS PROVEN RESISTANCE TO WEAR, TEAR AND SWELLING!

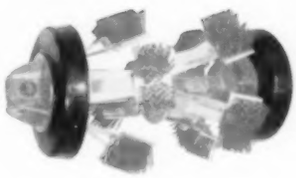


Actual photographs of TAPRSEAL cup before and after simulated pipeline test in ethyl gasoline for five days (500 miles)

Williamson testing equipment, the only repetitive COMPARATIVE cup tester in existence, has proven the TAPRSEAL to be WEAR RESISTANT . . . TEAR RESISTANT and SWELL RESISTANT. As the photographs show, there were no tears or breaks and only minimum wear after this torturous test.

Specify WmSon TAPRSEAL Scraper Cups . . . developed after years of research . . . proven after months of testing.





TAPRSEAL Scraper cups for all types of pipeline scrapers from 2" to 36".

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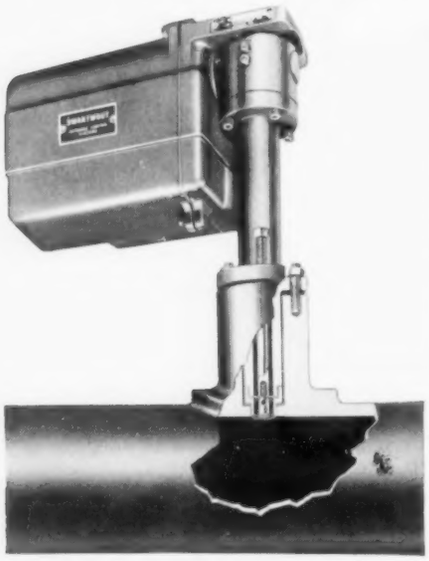
Great things are happening in AutroniC® Control

TOUGH PROBLEMS ARE NO PROBLEM



FOR THIS FOOLPROOF, FOUL-PROOF PRESSURE TRANSMITTER

Here is a primary sensing element for those tough jobs you'd like to forget. Mounted right on the process pipeline or tank, the Swartwout Flush Diaphragm Pressure Transmitter will effortlessly measure pressure or liquid level of polymers, slurries, asphalts, viscous fluids, molten metals and other difficult media. No stagnant pressure lines, no steam jacketing necessary . . . the stainless steel transmitter diaphragm fits flush with the inside of the vessel.

A friction-free linkage multiplies diaphragm motion and actuates the core of a differential transformer to produce a 0-0.5V AC signal for any Swartwout AutroniC indicator, recorder or controller. Sensitivity is better than 0.005%, reproducibility 0.1%, accuracy 1.0%.

The Flush Diaphragm Pressure Transmitter is just one unit in the constantly-growing AutroniC family of electronic instrumentation . . . a family that includes all necessary components for complete electronic control of any process parameter.

For details on the Flush Diaphragm Pressure Transmitter, request Bulletins A-713 and A-718. The Swartwout Co., 18511 Euclid Ave., Cleveland 12, Ohio.

SWARTWOUT

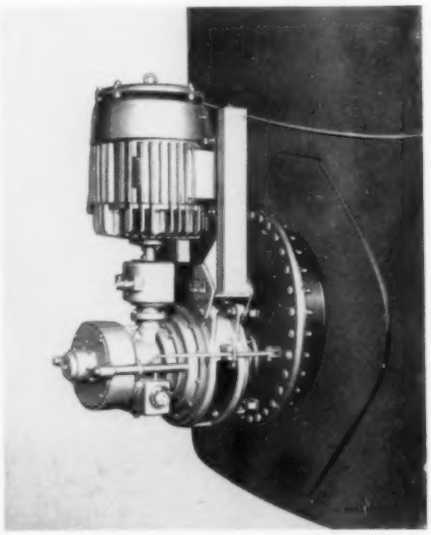
. . . world leader in electronic process instrumentation

S.A. 1958

generator terminals. A selection of adapters make it possible to attach the generator to most any driver.

(This item supplements Allis-Chalmers data on pages 41-44 of the Pipe Line Catalog, Second Revision.)

For more data, circle **No. E16** on Readers' Service Card, last page this issue.



Lightweight Mixers

Jensen Engineering Company announces its 300 Series mixers. The lightweight, side-entering mixers vary from 505 to 575 pounds, less the weight of the motor on models with horsepower from 5 to 25.

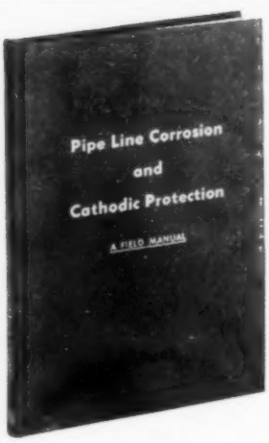
The new line features spiral bevel gears and an easy mechanical seal change which is readily interchangeable from mechanical seal to packing in the field. Also it can be converted to a high temperature unit in the field. All models have a propeller speed of 425 rpm.

For more data, circle **No. E17** on Readers' Service Card, last page this issue.

Rubber Tire Crane

Thew Shovel Company announces the 80-ton Moto-Crane, Model MC-875 as an addition to its line of rubber tired cranes. New developments included on the crane are shear ball turntable mountings, two-lever joy stick air controls, square-tubular-chord boom and one piece cast steel carrier frame. The machine handles up to 200 feet of boom plus 40-foot tip extension which is also of square-tubular-chord construction. Other features are spur gear driven boom hoist, anti-friction bearing mounted hoist drums and power operated tilting and folding gantry. The unit has 10 travel speeds up to 20 mph.

For more data, circle **No. E18** on Readers' Service Card, last page this issue.



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Pipe Line Corrosion and Cathodic Protection

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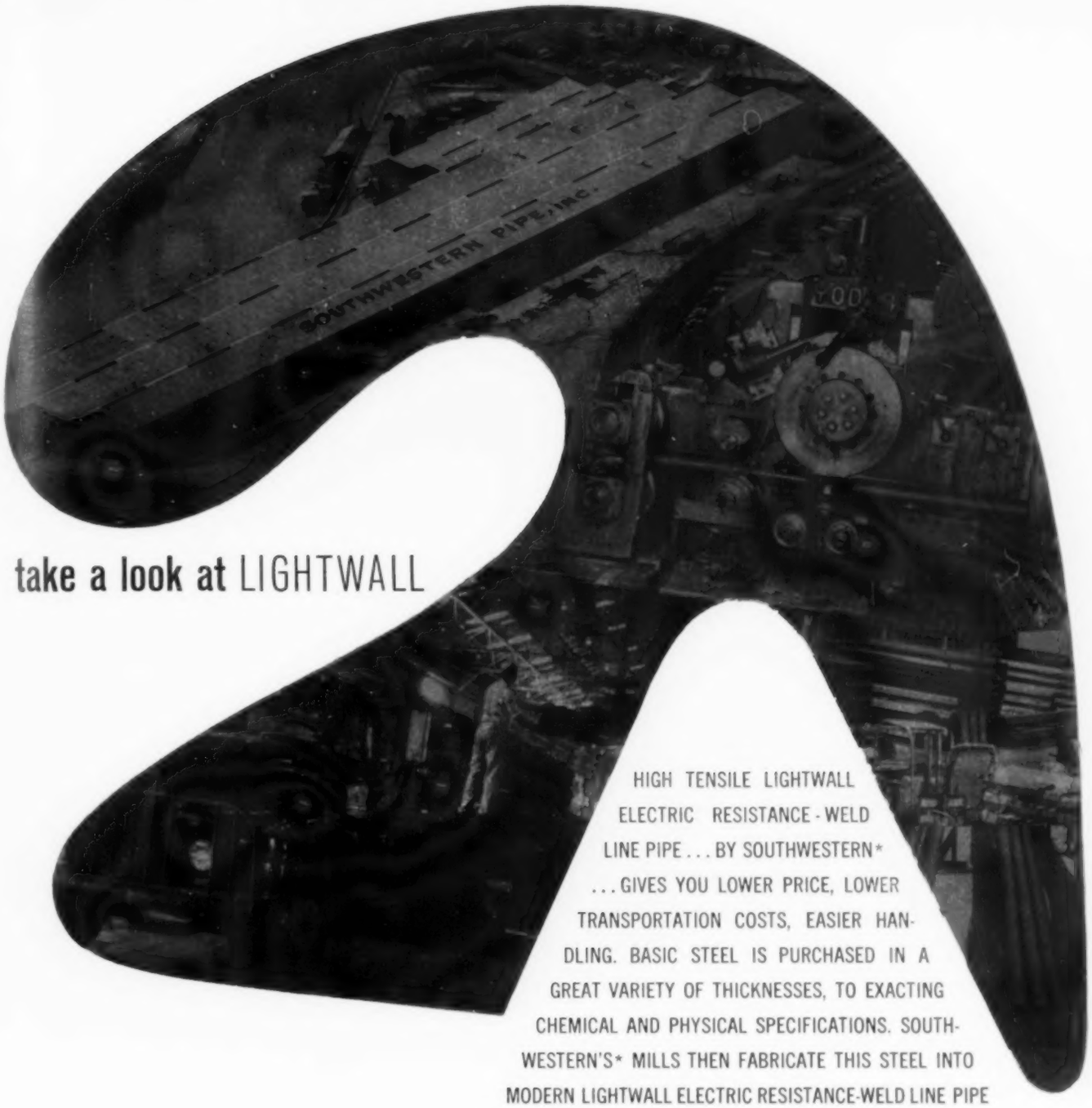

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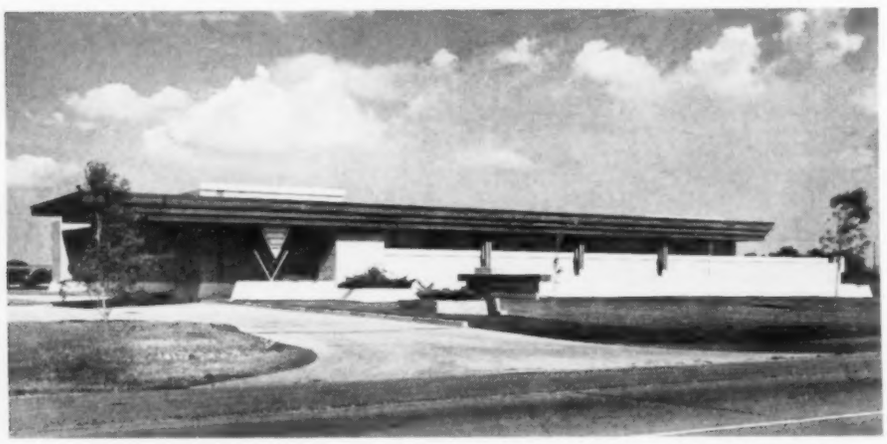

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New Equipment Literature

For more data on New Equipment or copies of Catalogs and Literature reviewed in this issue, use the Reader Service postcards just inside the back cover and facing the Advertisers' Index. Simply circle code numbers of items desired—sign and mail card.

High Filtration

Thornhill-Craver Company announces the availability of a report on a test which was conducted to show how ultra fine particulate matter can be removed from aviation fuels by using a filter aid in conjunction with jet type self-cleaning strainers.

Thornhill-Craver and Southern Pacific Pipeline Company conducted the test using 600 gpm jet strainers equipped with 400-mesh Dutch twill screen coated with diatomaceous earth.

To get a copy, circle **No. E19** on Readers' Service Card, last page this issue.

Vertical Turbine Pumps

Worthington Corporation has issued a 16-page bulletin on its ultra high flow (UHF) vertical turbine pump. The pump maintains high efficiencies over wider operating ranges, assuring continual and efficient service under any variety of accidental conditions. By increasing the range over which it operates efficiently the pump also secures a reduction in power costs.

The bulletin contains detailed illustrations of the variety of pumps and their components.

To get a copy, circle **No. E20** on Readers' Service Card, last page this issue.

Wiring System

"Wiring and Wiring System Standards for Industrial Use" has been published as a bulletin by Rome Cable Corporation. R. C. Graham, chief engineer at Rome, first presented the bulletin's technical information at the Commercial and Industrial Wiring Conference in Los Angeles.

The paper features sections on automation, conduit systems, troughs, trays, ladders, bus ducts and other new products and wiring methods, as well as an illustrative table and a recent bibliography on the subject.

To get a copy, circle **No. E21** on Readers' Service Card, last page this issue.

Engine Specifications

Specifications for oil field engines are given in a new book published by Engine Division of Caterpillar Tractor Company.

Contained in the 12-page booklet are five pages of condensed specifications for all models of Caterpillar diesel and natural gas engines. Included are specifications for hoisting, pumping and drilling duty as well as engine-converter, marine and electric set data.

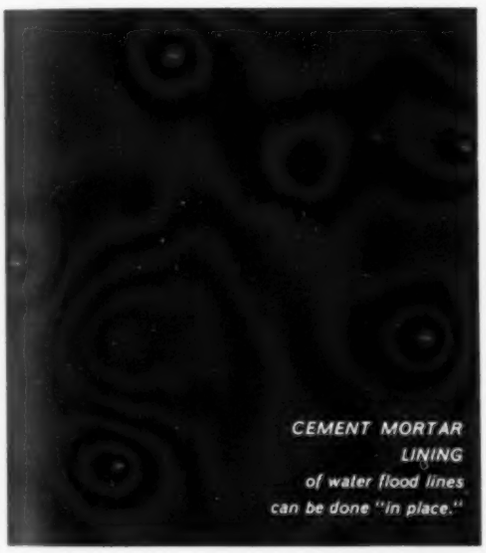
To get a copy, circle **No. E22** on Readers' Service Card, last page this issue.

Mercury Relay

An improved mercury relay, having a plunger bearing surface of Teflon, is described in a four-page bulletin issued by Mack Electric Devices, Inc. The Phaertitron relay retains advantages of mercury relays and adds to the length of its operating life. Photographs and diagrams illustrate the relay's construction.

CORROSION IN WATER FLOOD PIPE LINES?

WATER FLOOD
PIPE LINES
can be protected
from corrosive waters.



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WHERE CORROSIVE WATER is causing too frequent water line problems, Cement Mortar Lining is your answer.

And where raw water lines are being installed, Cement Mortar Linings are advisable, before the pipe goes in.

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Division of American Pipe and Construction Co.

The bulletin also explains the operating principle of the normally open type and normally closed type of relay as well as the accessibility of the load terminals for convenient installation and ease with which the tube can be replaced when broken through unusual abuse.

To get a copy, circle **No. E23** on Readers' Service Card, last page this issue.

Steel Line Pipe

Describing the manufacture of steel line pipe up to 36-inch in diameter, Kaiser Steel Corporation has released a 40-page booklet.

The booklet is divided into three sections: continuous weld pipe from ½ inch to 4 inches; electric resistance weld pipe through 18 inches; and electric weld pipe from 20 to 36 inches. Illustrations, descriptions and diagrams are included in each section.

To get a copy, circle **No. E24** on Readers' Service Card, last page this issue.

Turbocharged Compressor

Cooper-Bessemer Corporation has issued a 12-page bulletin on the turbocharged type GMXC compressor describing details on the packaged units. Available as non-skid and pre-piped skidded units these engine driven compressors are designed for heavy-duty requirements on pickup, gathering, field storage, repressuring and gas processing services.

To get a copy, circle **No. E25** on Readers' Service Card, last page this issue.

Crawler Tractor

Allis-Chalmers Manufacturing Company has published a two-color, 16-page catalog covering its HD-21 crawler tractor powered by the 225 horsepower turbocharged diesel 21,000 engine.

Included in the illustrated bulletin are features of the hydraulic torque converter drive, highlights of the diesel engine, design and construction features of the components, plus a list of accessories available to increase work capacity of the tractor.

To get a copy, circle **No. E26** on Readers' Service Card, last page this issue.

Readout Systems

A multiple pressure readout system is described by Fischer & Porter in its 12-page, two-color catalog. The readout system measures and records hundreds of different pressures simultaneously using a single high accuracy transducer.

To get a copy, circle **No. E27** on Readers' Service Card, last page this issue.

Welding Machines

A six-page, fold-out bulletin, published by Lincoln Electric Company, describes operating features, construction details and applications for a new line of welding machines.

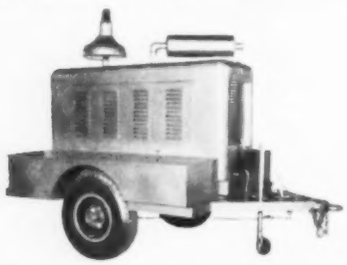
The machines are convertible for all manual arc welding applications: DC manual electrode, AC manual electrode, DC inert gas and AC inert gas. Detailed description of the Lincoln Idealarc and operating data are contained in the bulletin.

To get a copy, circle **No. E28** on Readers' Service Card, last page this issue.

There's VERSATILITY in your PIPE LINE SERVICE and ***Portability*** *with...*

U.S.

Portable U.S. Versa-Trailer standby emergency power units in sizes from 10 kw to 35 kw capacity provide single phase power for lights and 3-phase power for other requirements.



Versatile mobile power units provide for foolproof selection of desired current with selector plugs and cables.

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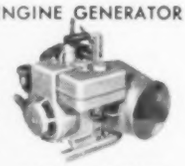
Portable blowers are especially suited for ejecting smoke, fumes, stale, contaminated air, and for purging tank cars, field storage tanks, etc. Motor driven or engine blowers are available.



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Advertisers' Index

• Dot preceding name of advertiser indicates that detailed data on products and services of the firm will be found in current (1959-60) second revision of The Pipe Line Catalog.

A

• ACF Industries, Inc.
W-K-M Division ..... 25 and 134
Acme-Newport Steel Co. 17
• Allied Chemical Corp.
Plastics & Coal Chemicals Division 11
• Allis-Chalmers 29
American Pipe & Construction Co. 129
• American-Standard Industrial Division
American Blower Products 30-31
Ansco Division
General Aniline & Film Corp. 81

B

Bendix Aviation Corp.
Scintilla Division 113
• Bonney Forge & Tool Works 101
Boring and Tunneling Co. of America 112
The Briggs Filtration Co. 88
The Bristol Co. 34
Broderick & Bascom Rope Co. 2

C

Cal-Metal Pipe Corp. 91c
Sam Carline, Inc. 16
• Caterpillar Tractor Co. 14-15
Celanese Corporation of America 18-19
Chase & Sons, Inc. 89
Classified Advertising 116
• The Colorado Fuel & Iron Corp. 97
Colorado Oil & Gas Corp. 91b
Cook Paint & Varnish Co. 21
• G. A. Cotten Co. 130b
• M. J. Crose Manufacturing Co. 107a

D

• Darling Valve & Manufacturing Co. 27
Davis Instruments 104
• S. D. Day Co. 116

E

Emhart Manufacturing Co.
Maxim Division 98

F

Fairbanks, Morse & Co. 123
Fisher Governor Co. 13
Fleet-Line Co. 114c
Ford Motor Co. 22

G

The Garlock Packing Co. 12
• Gaso Pump & Burner Mfg. Co. 10
General Aniline & Film Corp. 81
General Dynamics Corp. 85
Good-All Electric Mfg. Co. 114b
• Grove Valve & Regulator Co. 122
Gulf Oil Corp. 35
• The Gulf Publishing Co. 126b

H

Hackney Iron & Steel Co. 108b
Houston Contracting Co. 128

J

The Jaeger Machine Co. 33
Jo-Bell Products, Inc. 109b
• Johns-Manville Corp. 8-9

K

Ka-Mo Tools Department
Kwik-Mix Co. 120
Kerotest Manufacturing Co. 115
Koehring Co. ..... 120 and 121
Koppers Co. 24

L

LimiTorque Corp. 93
The Lincoln Electric Co. 105
Lone Star Steel Co. 6

M

Maintenance Mechanical Corp. 110
Majestic Contractors Ltd. 107b
• Marsh Instrument Co.
Division Colorado Oil & Gas Corp. 91b
• Mason-Neilan Division
Worthington Corp. 86-87
• C. A. Mathey Machine Works, Inc. 106
• Mavor-Kelly Co. 91a
Maxim Division
Emhart Manufacturing Co. 98
• Morris-Young-Owens Co. ..... 99, 108a and 114a

N

National Marine Service, Inc. 94
Nicolet Industries, Inc. 26

O

• Oil Well Supply Division
United States Steel 5

P

Parker Seal Co.
Division Parker-Hannifin Corp. 20
Parsons Co.
Division of Koehring 121
Philadelphia Gear Corp. 93
• Pipe Line Catalog 116-119
• Pipe Line Industry 38
Pipe Line Service Corp. 23
Pipe Linings Division
American Pipe & Construction Co. 129
• Plastics and Coal Chemicals Division
Allied Chemical Corp. 11

R

• Reilly Tar & Chemical Corp. 100
• Rochester Manufacturing Co. 83

S

Sachse Electric Inc. 109a
Safety Gas Main Stopper Co. 80
Scintilla Division
Bendix Aviation Corp. 113
Shand & Jurs Co. 111
• M. B. Skinner Co. 94
Southern Pipe Division
U. S. Industries, Inc. 95
Southwestern Pipe, Inc. 127
• Steel Forgings, Inc. 90
Stromberg-Carlson Division
General Dynamics Corp. 85
The Swartwout Co. 126a

T

Tex-Tube, Inc. 102-103
• Thornhill-Craver Co. 32
The Trane Co. 28
Transcontinental Gas Pipe Line Corp. 96

U

U. S. Industries, Inc. 95
• United States Motors Corp. 130a
• United States Steel Corp. 5

V

The Vapor Recovery Systems Co. 133

W

• W-K-M Division
ACF Industries, Inc. ..... 25 and 134
Wilkening Manufacturing Co. 7
• T. D. Williamson, Inc. 125
Wisconsin Motor Corp. 124
• Worthington Corp. 86-87

Y

The Youngstown Sheet & Tube Corp. 36-37

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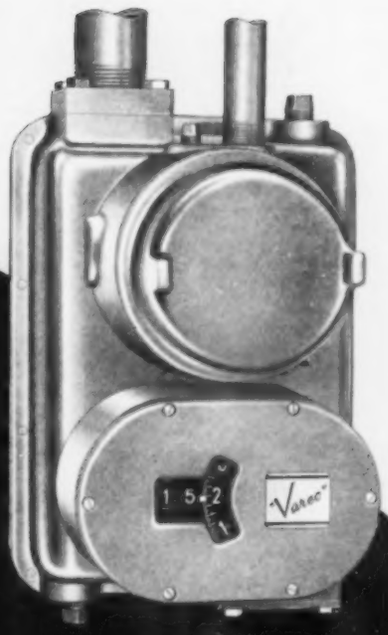
Power Operated

liquid level

TANK GAUGE



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The *Dynamatic* Power Operated Gauge utilizes a force balance system arranged to detect and display liquid level. The measuring device consists of two elements; a force measuring element and a displacer that is a solid plate of any material suitable to the environmental conditions.

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